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# ISLANDS WATERSHED 2000 WATER QUALITY ASSESSMENT REPORT



Vineyard Haven Harbor, Tisbury/Oak Bluffs, Martha's Vineyard

COMMONWEALTH OF MASSACHUSETTS  
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ISLANDS WATERSHED  
2000 WATER QUALITY ASSESSMENT REPORT

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  - Division of Fisheries and Wildlife (MassWildlife)
  - Division of Marine Fisheries (DMF)
- Department of Environmental Management (MA DEM) (now Department of Conservation and Recreation, Division of State Parks and Recreation)

### Federal

- United States Environmental Protection Agency (EPA)
- United States Geological Survey (USGS)
  - Water Resources Division

### Regional

- Martha's Vineyard Commission (MVC)
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## LIST OF ACRONYMS

7Q10	seven day, ten year low flow
ACEC	Area of Critical Environmental Concern
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
BRP	Bureau of Resource Protection
CMR	Code of Massachusetts Regulations
CWA	Clean Water Act
DCPC	District of Critical Planning Concern
DDT	Dichlorodiphenyltrichloroethane
DFWELE	Department of Fisheries, Wildlife and Environmental Law Enforcement
DMF	Division of Marine Fisheries
DO	dissolved oxygen
DWM	Division of Watershed Management
DWP	Drinking Water Program
EOEA	Executive Office of Environmental Affairs
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
GPS	Global Positioning System
MA DEM	Massachusetts Department of Environmental Management
MA DEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Geographic Information System
MassWildlife	Division of Fisheries and Wildlife
MDPH	Massachusetts Department of Public Health
MGL	Massachusetts General Law
MVC	Martha's Vineyard Commission
MVLB	Martha's Vineyard Land Bank
MWI	Massachusetts Watershed Initiative
NEAR	Northeast Aquatic Research
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NSSP	National Shellfish Sanitation Program
ORW	Outstanding Resource Water
PCB	Polychlorinated biphenol
PWS	Public Water Supply
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RBP	Rapid Bioassessment Protocol
SDWA	Safe Drinking Water Act
SMAST	School of Marine Science and Technology
SWQS	Surface Water Quality Standards
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TNTC	Too Numerous To Count
TOC	Total Organic Carbon
TRC	Total Residual Chlorine
TSS	Total Suspended Solids
UMASS	University of Massachusetts
USCG	United States Coast Guard
USGS	United States Geological Survey
WBID	Waterbody Identification Number
WBS	Waterbody System
WMA	Water Management Act



## LIST OF UNITS

CFU	colony forming unit
GPD	gallons per day
MGD	million gallons per day
mg/L	milligram per liter
mg/m <sup>3</sup>	milligram per cubic meter
ml/L	milliliter per liter
MPN	most probable number
ng	nanogram
ppb	parts per billion
ppm	parts per million
SU	standard units
TEQ/kg	toxic equivalents per kilogram
µg/kg	microgram per kilogram
µS/cm	microSiemens per centimeter

## EXECUTIVE SUMMARY

### ISLANDS WATERSHED

### WATER QUALITY ASSESSMENT REPORT

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which surface waters in the Commonwealth shall be protected. The assessment of current water quality conditions is a key step in the successful implementation of the Watershed Approach. This critical phase provides an assessment of whether or not the designated uses are being met (support or impaired) or are not assessed, as well as basic information needed to focus resource protection and remediation activities later in the watershed management planning process. Twelve segments in the Islands watershed are on the 1998 Section 303(d) List of Waters.

This assessment report presents a summary of current water quality data/information used to assess the status of the designated uses as defined in the Massachusetts surface water quality standards. Each use, within a given segment, is individually assessed as **support** or **impaired**. When too little current data/information exists or no reliable data are available the use is **not assessed**. However, if there is some indication of water quality impairment, which is not "naturally occurring", the use is identified with an "Alert Status". It is important to note that not all waters are assessed. Many small and/or unnamed rivers, estuaries and lakes are currently **unassessed**; the status of their designated uses has never been reported to the United States Environmental Protection Agency (EPA) in the Massachusetts 305(b) Report nor is information on these waters maintained in the Waterbody System (WBS) database.

The designated use status is presented for 24 named salt ponds/coastal embayments (25.3 square miles), four river segments (7.3 miles out of 15 named rivers/streams totaling 19.4 miles) and four freshwater ponds (92 acres) in the Islands Watershed.

#### AQUATIC LIFE USE

The *Aquatic Life Use* is supported when suitable habitat (including water quality) is available for sustaining a native, naturally diverse, community of aquatic flora and fauna. Impairment of the *Aquatic Life Use* may result from anthropogenic stressors that include point and/or nonpoint sources of pollution and hydrologic modification.

Twelve percent of the Islands Watershed salt pond/coastal embayment segments reviewed in this report were assessed (support or impaired) for the *Aquatic Life Use* (Figure 1). One coastal embayment (Madaket Harbor, Nantucket, 1.4 square miles) was supported for this use. The remaining 1.7 square miles (Polpis Harbor, Hither Creek and Long Pond, all on Nantucket and Lagoon Pond and Lake Tashmoo on Martha's Vineyard) were impaired for the *Aquatic Life Use* for known and/or suspected causes, including loss of eelgrass bed habitat, total nitrogen, tidal restriction, dissolved oxygen and anthropogenic activities that result in poor water quality. Suspected sources of impairment include: recreational activities (boat traffic), stormwater, on-site septic systems, and poor tidal circulation. All of the river miles in this report were assessed as supporting the *Aquatic Life Use* and all of the freshwater pond acreage was not assessed.

The status of the *Aquatic Life Use* for waterbodies assessed in the Islands Watershed is as follows:

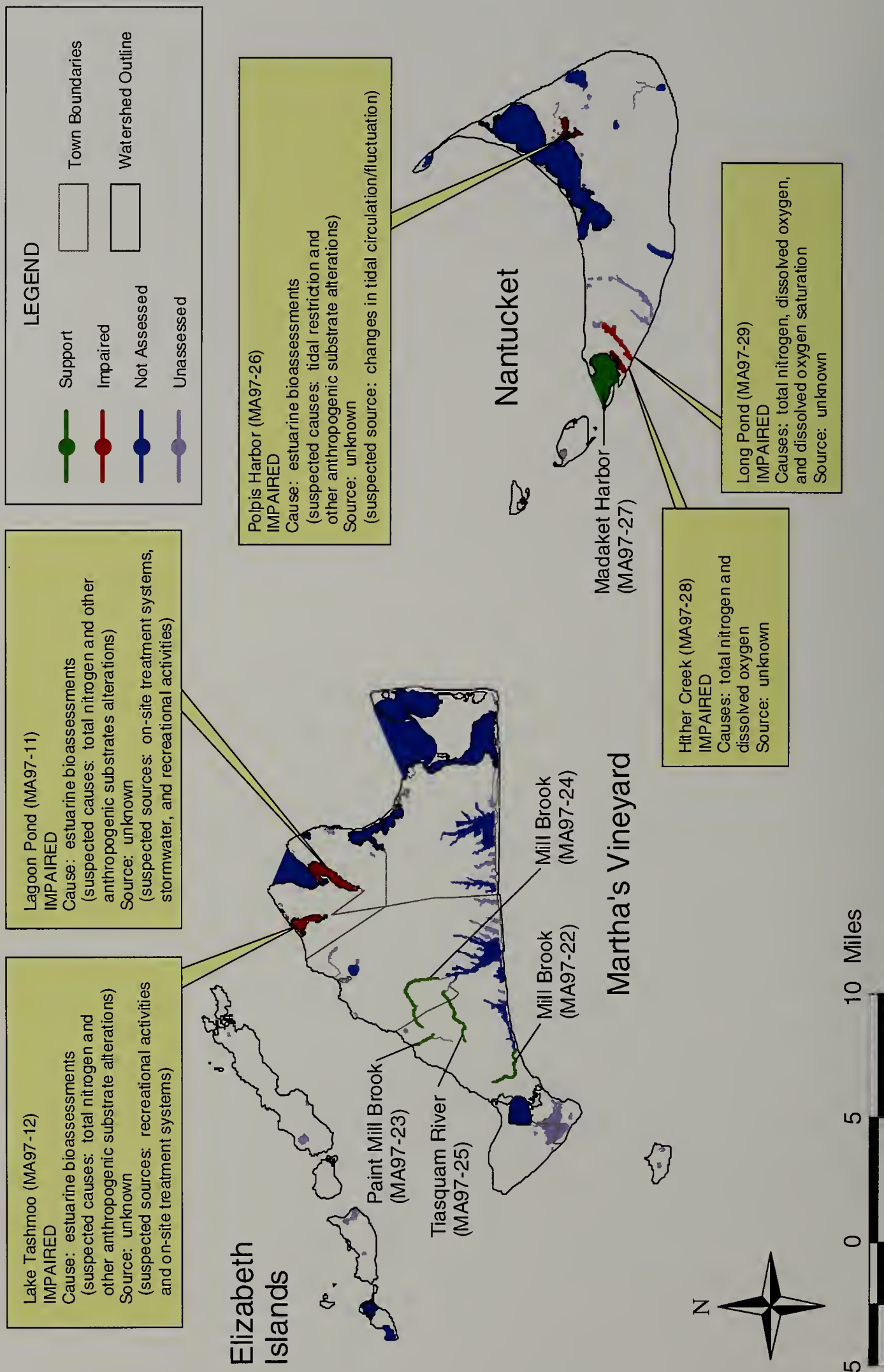
<b><i>Aquatic Life Use Summary</i></b>				
<b>Waterbody Type</b>	<b>Support</b>	<b>Impaired</b>	<b>Not Assessed</b>	<b>Total</b>
Salt Ponds and Coastal Embayments (square miles)	1.4	1.7	22.2	25.3
Rivers (miles)	7.3	0	0	7.3
Freshwater Ponds (acres)	0	0	92	92





# ISLANDS WATERSHED

## Aquatic Life Use Assessment Summary





### **FISH CONSUMPTION USE**

The *Fish Consumption Use* is supported when there are no pollutants present that result in unacceptable concentrations in edible portions of fish. The assessment of this use is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MDPH), Bureau of Environmental Health Assessment. The MDPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species poses a health risk for human consumption; hence the *Fish Consumption Use* is assessed as impaired in these waters.

NOTE: In July 2001, MDPH issued new consumer advisories on fish consumption and mercury contamination (MDPH 2001). The MDPH "is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MDPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age."

Additionally, MDPH "is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury." MDPH's statewide advisory does not include fish stocked by the Massachusetts Division of Fisheries and Wildlife or farm-raised fish sold commercially.

Because of health concerns associated with exposure to mercury, MDPH issued fish consumption advisories for Gibbs Pond (MA97028), Miacomet Pond (MA97055), and Tom Nevers Pond (MA97097) (MDPH 2002a). Therefore, the *Fish Consumption Use* is impaired for these ponds (88% of the freshwater pond acreage assessed in the Islands Watershed). The remaining acreage was not assessed due to MDPH's revised statewide advisory for mercury that encompasses all Massachusetts waters. There are currently no site-specific MDPH-issued fish consumption advisories for any salt ponds/coastal embayments or river segments in the Islands Watershed.

The status of the *Fish Consumption Use* for waterbodies assessed in the Islands Watershed is as follows:

<b>Fish Consumption Use Summary</b>				
<b>Waterbody Type</b>	<b>Support</b>	<b>Impaired</b>	<b>Not Assessed</b>	<b>Total</b>
Salt Ponds and Coastal Embayments (square miles)	0	0	25.3	25.3
Rivers (miles)	0	0	7.3	7.3
Freshwater Ponds (acres)	0	81	11	92

### **DRINKING WATER USE**

The term *Drinking Water Use* has been used to indicate sources of public drinking water. While this use is not assessed in this report, information on drinking water source protection and finish water quality is available at <http://www.state.ma.us/dep/brp/dws/dwshome.htm> and from the Islands Watershed's public water suppliers. These waters are subject to stringent regulation in accordance with the Massachusetts Drinking Water Regulations. The Massachusetts Department of Environmental Protection's (MA DEP's) Drinking Water Program (DWP) has primacy for implementing the provisions of the federal Safe Drinking Water Act. DWP has also initiated work on its Source Water Assessment Program, which requires that the Commonwealth delineate protection areas for all public ground and surface water sources; inventory land uses in these areas that may present potential threats to drinking water quality; determine the susceptibility of water supplies to contamination from these sources; and publicize the results. Except for suppliers with surface water sources for which a waiver from filtration has been granted (these systems also monitor surface water quality), public water suppliers monitor their finished water (tap water) for major categories of contaminants (e.g., bacteria, volatile and synthetic organic compounds, inorganic compounds, etc.) and report their data to DWP.



### **SHELLFISH HARVESTING USE**

The *Shellfish Harvesting Use* is supported when shellfish harvested from Approved (Class SA or SB) or Conditionally Approved (Class SB) Shellfish Growing Areas are suitable for consumption without depuration and when shellfish harvested from Restricted (Class SB) Shellfish Growing Areas are suitable for consumption with depuration. The Division of Marine Fisheries (DMF) classifies shellfishing areas in the Islands Watershed. The *Shellfish Harvesting Use* for this report was assessed using the DMF shellfishing closure list dated 1 July 2000 and published on Massachusetts Geographic Information System (MassGIS) in October 2000.

The status of the acres of shellfishing beds in the Islands Watershed (including areas that extend into open-water) is as follows:

DMF Classification Type	MA DEP Designated Use Status (all waters are SA)	DMF Area (acres)	Percent of total DMF acreage
Approved	Support	401458.660	99%
Conditionally Approved	Impaired	3439.702	<1%
Restricted	Impaired	0	0%
Conditionally Restricted	Impaired	0	0%
Prohibited	Impaired	1311.928	<1%
Management Closure	Not Assessed	108.067	<1%

Individual DMF management area classifications are provided in Appendix D of this report. It should be noted that DMF's areas are defined in acres of potential shellfishing habitat.

### **PRIMARY AND SECONDARY CONTACT RECREATION USES**

The *Primary Contact Recreation Use* is supported when conditions are suitable (fecal coliform bacteria densities, transparency, pH, temperature, turbidity and aesthetics meet the Surface Water Quality Standards) for any recreational or other water related activity during which there is prolonged and intimate contact with the water with a significant risk of ingestion. Activities include, but are not limited to, wading, swimming, diving, surfing and water skiing. The *Secondary Contact Recreation Use* is supported when conditions are suitable for any recreational or other water use during which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities.

Eighty-eight percent of the salt pond/coastal embayment segments and 37% of the freshwater pond acreage reviewed in this report were assessed as supporting the *Primary* and *Secondary Contact Recreation uses* (Figure 2). One salt pond (Long Pond, Nantucket) was impaired for the *Primary Contact Recreation Use* due to elevated bacteria counts and poor water clarity, but supported the *Secondary Contact Recreation Use*. One freshwater pond (Seths Pond, West Tisbury) was impaired for the *Primary Contact Recreation Use* due to poor transparency (i.e., Secchi disk depth readings below the bathing beach guidance). Seths Pond was not assessed for *Secondary Contact Recreation*, but given an "Alert Status". The remaining salt pond/coastal embayment areas, river miles and pond acreage were not assessed.

The status of the *Primary* and *Secondary Contact Recreation Uses* for waterbodies assessed in the Islands Watershed is as follows:

<b>Primary and Secondary Contact Recreation Uses Summary</b>				
Waterbody Type	Support	Impaired	Not Assessed	Total
Salt Ponds and Coastal Embayments (square miles)	22.3	0.1*	2.9	25.3
Rivers (miles)	0	0	7.3	7.3
Freshwater Ponds (acres)	34	11**	47	92

\*Impaired for the Primary Contact Recreation Use only. The Secondary Contact Recreation Use is supported.

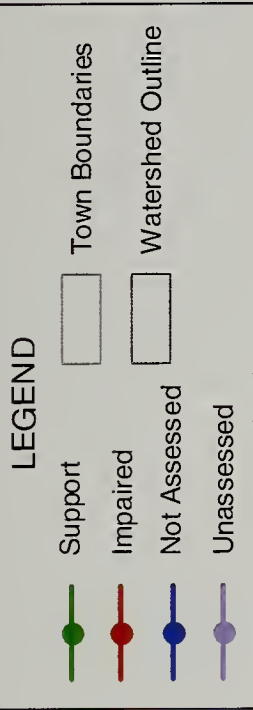
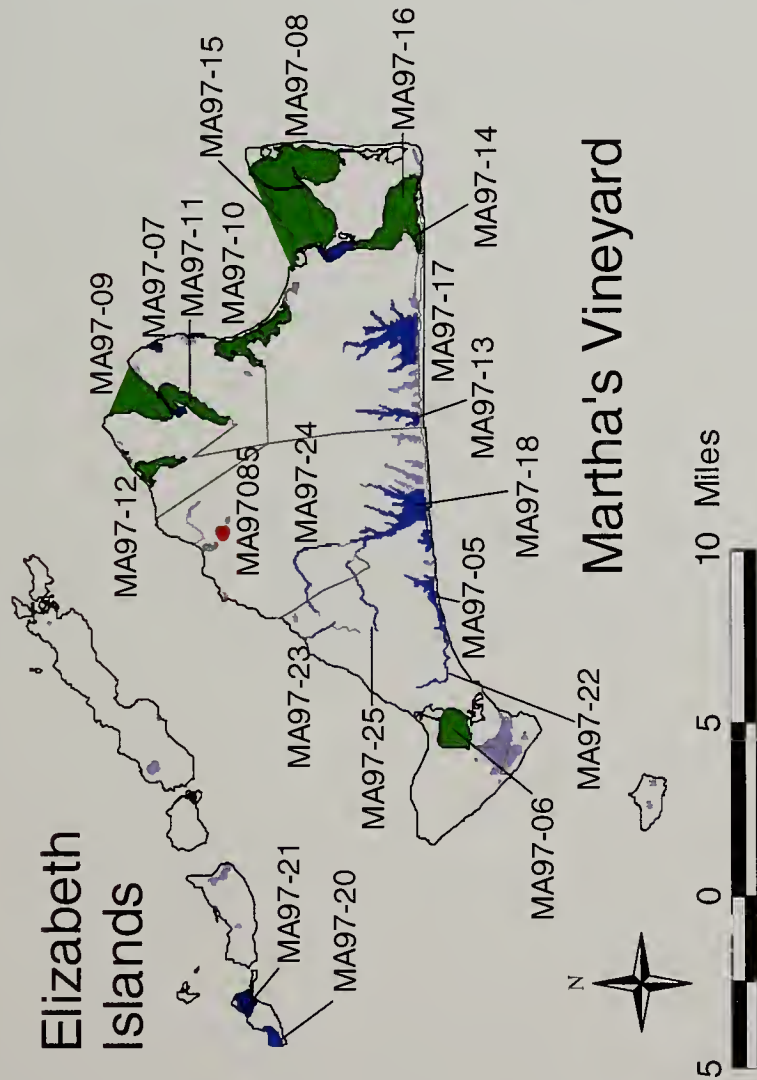
\*\*Impaired for the Primary Contact Recreation Use only. The Secondary Contact Recreation Use is not assessed, but given an "Alert Status".





# ISLANDS WATERSHED

## Primary and Secondary Contact Recreation Uses Assessment Summary



Elizabeth Islands:	Martha's Vineyard:	Nantucket:
MA97-20 Westend Pond	MA97-05 Chilmark Pond	MA97-01 Nantucket Harbor
MA97-21 Cuttyhunk Pond	MA97-06 Sesachacha Pond	MA97-02 Sesachacha Pond
	MA97-07 Oak Bluffs Harbor	MA97-03 Coskata Pond
	MA97-08 Cape Poge Bay	MA97-04 Great Point Pond
	MA97-09 Vineyard Haven Harbor	MA97-26 Polpis Harbor
	MA97-10 Sengokontacket Pond	MA97-028 Gibbs Pond
	MA97-11 Lagoon Pond	MA97-055 Miacomet Pond
	MA97-12 Lake Tashmoo	MA97-097 Tom Nevers Pond
	MA97-13 Oyster Pond	
	MA97-14 Mattakeset Bay	
	MA97-15 Edgartown Harbor	
	MA97-16 Katama Bay	
	MA97-17 Edgartown Great Pond	
	MA97-18 Tisbury Great Pond	

\*Long Pond is impaired for Primary Contact Only, Secondary Contact is supported.

\*\*Seths Pond is impaired for Primary Contact only, Secondary Contact is not assessed, but with an "Alert Status".



## **AESTHETICS USE**

The *Aesthetics Use* is supported when surface waters are free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.

The status of the *Aesthetics Use* for waterbodies assessed in the Islands Watershed is as follows:

<b><i>Aesthetics Use Summary</i></b>				
<b>Waterbody Type</b>	<b>Support</b>	<b>Impaired</b>	<b>Not Assessed</b>	<b>Total</b>
Salt Ponds and Coastal Embayments (square miles)	1.4	0	23.9	25.3
Rivers (miles)	7.3	0	0	7.3
Freshwater Ponds (acres)	0	0	92	92

## **RECOMMENDATIONS**

The evaluation of current water quality conditions in the Islands Watershed has revealed the need for the following.

- As part of the Water Management Act (WMA) 5-year review process, MA DEP should continue to evaluate compliance with registration and/or permit limits for withdrawals in the Islands Watershed. Work with water suppliers to implement optimal water conservation measures that maintain or reduce water withdrawals and encourage the development and implementation of local watershed and wellhead protection plans.
- Make estuarine resource protection efforts a priority for the Islands Watershed in support of the commercial and recreational fishing and tourism industries in this area that rely heavily on excellent water quality.
- Coordinate with the MA Department of Environmental Management (MA DEM) and/or other groups conducting lake and watershed surveys to generate quality-assured data. As part of any lake water quality evaluation include the identification of non-native species and mapping of macrophyte cover in order to evaluate the status of the *Aquatic Life*, *Recreation* and *Aesthetics* uses.
- Identify the needs and assist in the development of the Massachusetts Estuaries Project nutrient and bacteria Total Maximum Daily Loads (TMDLs).
- When the final report becomes available, review and implement, as applicable, recommendations in the fiscal year 2003 604(b) grant project *Coastal Pond Water Quality Assessment*. The ponds to be sampled include: Sengekontacket Pond, Cape Poge Bay, Poucha Pond, Lake Tashmoo, Oak Bluffs Harbor, Farm Pond, Menemsha Pond, Chilmark Pond, and Squibnocket Pond.

## INTRODUCTION

The Massachusetts Watershed Approach is a collaborative effort between state and federal environmental agencies, municipal agencies, citizens, non-profit groups, businesses and industries in the watershed. The mission is to improve water quality conditions and to provide a framework under which the restoration and/or protection of the watershed's natural resources can be achieved. Figure 2 illustrates the management structure to carry out the mission. This report presents the current assessment of water quality conditions in the Islands Watershed. The assessment is based on information that has been researched and developed by the Massachusetts Department of Environmental Protection (MA DEP) through the first three years (information gathering, monitoring, and assessment) of the five-year cycle in partial fulfillment of MA DEP's federal mandate to report on the status of the Commonwealth's waters under the Federal Water Pollution Control Act (commonly known as the Clean Water Act).

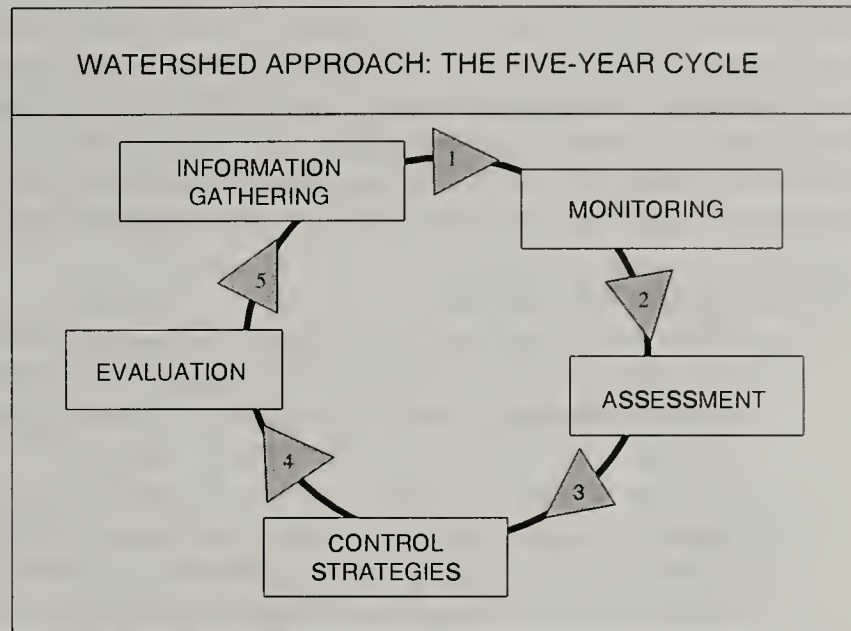


Figure 2. Five-year cycle of the Watershed Approach

The goal of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Environmental Law Reporter 1988). To meet this objective, the CWA requires states to develop information on the quality of the Nation's water resources and report this information to the U.S. Environmental Protection Agency (EPA), the United States Congress, and the public. Together, these agencies are responsible for implementation of the CWA mandates. Under Section 305(b) of the Federal Clean Water Act, MA DEP must submit a statewide report every two years to the EPA, which describes the status of water quality in the Commonwealth. Up until 2002, this was accomplished as a statewide summary of water quality (the 305(b) Report). States are also required to submit, under section 303(d) of the CWA, a list of waters requiring a total maximum daily load (TMDL) calculation. In 2002, however, EPA required the states to combine elements of the statewide 305(b) Report and the Section 303(d) List of Waters into one "Integrated List of Waters". This statewide list is based on the compilation of information for the Commonwealth's 27 watersheds. Massachusetts has opted to write individual watershed water quality assessment reports and use them as the supporting documentation for the Integrated List. The assessment reports utilize data compiled from a variety of sources and provide an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain at the watershed level. Instream biological, habitat, physical/chemical, toxicity data and other information are evaluated to assess the status of water quality conditions. This analysis follows a standardized process described below (Assessment Methodology). Once the use assessments have been completed the segments are categorized for the Integrated List.



## ASSESSMENT METHODOLOGY

### WATER QUALITY CLASSIFICATION

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria required to sustain the designated uses; and include provisions for the prohibition of discharges (MA DEP 1996). These regulations should undergo public review every three years. The surface waters are segmented and each segment is assigned to one of the six classes described below. Each class is identified by the most sensitive and, therefore, governing water uses to be achieved and protected. Surface waters may be suitable for other beneficial uses, but shall be regulated by the Department of Environmental Protection to protect and enhance the designated uses.

### INLAND WATER CLASSES

1. **Class A** – *These waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters (ORWs) under 314 Code of Massachusetts Regulations (CMR) 4.04(3).*
2. **Class B** – *These waters are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.*
3. **Class C** – *These waters are designated as a habitat for fish, other aquatic life and wildlife, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value.*

### COASTAL AND MARINE CLASSES

4. **Class SA** – *These waters are designated as an excellent habitat for fish, other aquatic life and wildlife and for primary and secondary recreation. In approved areas they shall be suitable for shellfish harvesting without depuration (Open Shellfishing Areas). These waters shall have excellent aesthetic value.*
5. **Class SB** – *These waters are designated as a habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. In approved areas they shall be suitable for shellfish harvesting with depuration (Restricted Shellfishing Areas). These waters shall have consistently good aesthetic value.*
6. **Class SC** – *These waters are designated as a habitat for fish, other aquatic life, and wildlife and for secondary contact recreation. They shall also be suitable for certain industrial cooling and process uses. These waters shall have good aesthetic value.*

The CWA Section 305(b) water quality reporting process is an essential aspect of the Nation's water pollution control effort. It is the principal means by which EPA, Congress, and the public evaluate existing water quality, assess progress made in maintaining and restoring water quality, and determine the extent of remaining problems. In so doing, the States report on waterbodies within the context of meeting their designated uses (described above in each class). Each class is identified by the most sensitive and, therefore, governing water uses to be achieved and protected. These uses include: *Aquatic Life, Fish Consumption, Drinking Water, Shellfish Harvesting, Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics*. Two subclasses of Aquatic Life are also designated in the standards: Cold Water Fishery (capable of sustaining a year-round population of cold water aquatic life, such as trout), and Warm Water Fishery (waters that are not capable of sustaining a year-round population of cold water aquatic life).

The SWQS, summarized in Table 1, prescribes minimum water quality criteria to sustain the designated uses. Furthermore, these standards describe the hydrological conditions at which water quality criteria must be applied (MA DEP 1996). In rivers, the lowest flow conditions at and above which aquatic life criteria must be applied are the lowest mean flow for seven consecutive days to be expected once in ten years (7Q10). In artificially regulated waters, the lowest flow conditions at which aquatic life criteria must



be applied are the flow equal or exceeded 99% of the time on a yearly basis or another equivalent flow that has been agreed upon. In coastal and marine waters and for lakes the most severe hydrological condition for which the aquatic life criteria must be applied shall be determined by MA DEP on a case-by-case basis.

The availability of appropriate and reliable scientific data and technical information is fundamental to the 305(b) reporting process. It is EPA policy (EPA Order 5360.1 CHG 1) that any organization, performing work for or on behalf of EPA establish a quality system to support the development, review, approval, implementation, and assessment of data collection operations. To this end, MA DEP describes its Quality System in an EPA-approved Quality Management Plan to ensure that environmental data collected or compiled by MA DEP are of known and documented quality and are suitable for their intended use. For external sources of information, MA DEP requires the following: 1) an appropriate *Quality Assurance Project Plan* (QAPP) including a laboratory Quality Assurance/Quality Control (QA/QC) plan, 2) use of a state certified lab (or as otherwise approved by MA DEP for a particular analysis), and 3) sample data, QA/QC and other pertinent sample handling information documented in a citable report.

EPA provides guidelines to the States for making their use support determinations (EPA 1997 and 2002b, Grubbs and Wayland III 2000 and Wayland III 2001). The determination of whether or not a waterbody supports each of its designated uses is a function of the type(s), quality and quantity of available current information. Although data/information older than five years are usually considered "historical" and used for descriptive purposes, they can be utilized in the use support determination provided they are known to reflect the current conditions. While the water quality standards (Table 1) prescribe minimum water quality criteria to sustain the designated uses, numerical criteria are not available for every indicator of pollution. Best available guidance in the literature may be applied in lieu of actual numerical criteria (e.g., freshwater sediment data may be compared to *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* 1993 by D. Persaud, R. Jaagumagi and A. Hayton). Excursions from criteria due to solely "naturally occurring" conditions (e.g., low pH in some areas) do not constitute violations of the standards.

Each designated use within a given segment is individually assessed as **support** or **impaired**. When too little current data/information exists or no reliable data are available, the use is **not assessed**. In this report, however, if there is some indication that water quality impairment may exist that is not "naturally occurring", the use is identified with an "Alert Status". Detailed guidance for assessing the status of each use follows in the Designated Uses Section of this report. It is important to note that not all waters are assessed. Many small and/or unnamed ponds, rivers, and estuaries are currently **unassessed**; the status of their designated uses has never been reported to EPA in the Commonwealth's 305(b) Report or the Integrated List of Waters nor is information on these waters maintained in the Waterbody System database (WBS) or the new Assessment Database (ADB).



Table 1. Summary of Massachusetts Surface Water Quality Standards (MA DEP 1996 and MDPH 2002b).

Dissolved Oxygen	<p><u>Class A, Class B Cold Water Fishery (BCWF), and Class SA:</u> <math>\geq 6.0</math> mg/L and <math>\geq 75\%</math> saturation unless background conditions are lower</p> <p><u>Class B Warm Water Fishery (BWFF) and Class SB:</u> <math>\geq 5.0</math> mg/L and <math>\geq 60\%</math> saturation unless background conditions are lower</p> <p><u>Class C:</u> Not <math>\leq 5.0</math> mg/L for more than 16 of any 24-hour period and not <math>\leq 3.0</math> mg/L anytime unless background conditions are lower; levels cannot be lowered below 50% saturation due to a discharge</p> <p><u>Class SC:</u> Not <math>\leq 5.0</math> mg/L for more than 16 of any 24-hour period and not <math>\leq 4.0</math> mg/L anytime unless background conditions are lower; and 50% saturation; levels cannot be lowered below 50% saturation due to a discharge</p>
Temperature	<p><u>Class A:</u> <math>\leq 68^{\circ}\text{F}</math> (<math>20^{\circ}\text{C}</math>) and <math>\Delta 1.5^{\circ}\text{F}</math> (<math>0.8^{\circ}\text{C}</math>) for Cold Water and <math>\leq 83^{\circ}\text{F}</math> (<math>28.3^{\circ}\text{C}</math>) and <math>\Delta 1.5^{\circ}\text{F}</math> (<math>0.8^{\circ}\text{C}</math>) for Warm Water.</p> <p><u>Class BCWF:</u> <math>\leq 68^{\circ}\text{F}</math> (<math>20^{\circ}\text{C}</math>) and <math>\Delta 3^{\circ}\text{F}</math> (<math>1.7^{\circ}\text{C}</math>) due to a discharge</p> <p><u>Class BWFF:</u> <math>\leq 83^{\circ}\text{F}</math> (<math>28.3^{\circ}\text{C}</math>) and <math>\Delta 3^{\circ}\text{F}</math> (<math>1.7^{\circ}\text{C}</math>) in lakes, <math>\Delta 5^{\circ}\text{F}</math> (<math>2.8^{\circ}\text{C}</math>) in rivers</p> <p><u>Class C and Class SC:</u> <math>\leq 85^{\circ}\text{F}</math> (<math>29.4^{\circ}\text{C}</math>) nor <math>\Delta 5^{\circ}\text{F}</math> (<math>2.8^{\circ}\text{C}</math>) due to a discharge</p> <p><u>Class SA:</u> <math>\leq 85^{\circ}\text{F}</math> (<math>29.4^{\circ}\text{C}</math>) nor a maximum daily mean of <math>80^{\circ}\text{F}</math> (<math>26.7^{\circ}\text{C}</math>) and <math>\Delta 1.5^{\circ}\text{F}</math> (<math>0.8^{\circ}\text{C}</math>)</p> <p><u>Class SB:</u> <math>\leq 85^{\circ}\text{F}</math> (<math>29.4^{\circ}\text{C}</math>) nor a maximum daily mean of <math>80^{\circ}\text{F}</math> (<math>26.7^{\circ}\text{C}</math>) and <math>\Delta 1.5^{\circ}\text{F}</math> (<math>0.8^{\circ}\text{C}</math>) between July through September and <math>\Delta 4.0^{\circ}\text{F}</math> (<math>2.2^{\circ}\text{C}</math>) between October through June</p>
pH	<p><u>Class A, Class BCWF and Class BWFF:</u> 6.5 - 8.3 SU and <math>\Delta 0.5</math> outside the background range.</p> <p><u>Class C:</u> 6.5 - 9.0 SU and <math>\Delta 1.0</math> outside the naturally occurring range.</p> <p><u>Class SA and Class SB:</u> 6.5 - 8.5 SU and <math>\Delta 0.2</math> outside the normally occurring range.</p> <p><u>Class SC:</u> 6.5 - 9.0 SU and <math>\Delta 0.5</math> outside the naturally occurring range.</p>
Solids	<i>All Classes: These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to each class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.</i>
Color and Turbidity	<i>All Classes: These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.</i>
Oil and Grease	<p><u>Class A and Class SA:</u> Waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants.</p> <p><u>Class SA:</u> Waters shall be free from oil and grease and petrochemicals.</p> <p><u>Class B, Class C, Class SB and Class SC:</u> Waters shall be free from oil and grease, petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course or are deleterious or become toxic to aquatic life.</p>
Taste and Odor	<p><u>Class A and Class SA:</u> None other than of natural origin.</p> <p><u>Class B, Class C, Class SB and Class SC:</u> None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to each class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.</p>
Aesthetics	<i>All Classes: All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.</i>
Toxic Pollutants	<i>All Classes: All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife... The Division shall use the recommended limit published by EPA pursuant to 33 USC 1251, 304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established.</i>
Nutrients	<i>Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.</i>

Note: Italics are direct quotations.

$\Delta$  criterion (referring to a change from natural background conditions) is applied to the effects of a permitted discharge.



Table 1. Summary of Massachusetts Surface Water Quality Standards – *Continued*.

<p>Bacteria (MA DEP 1996 and MDPH 2002b)</p> <p>Class A criteria apply to the <i>Drinking Water Use</i>.</p> <p>Class B and SB criteria apply to <i>Primary Contact Recreation Use</i> while Class C and SC criteria apply to <i>Secondary Contact Recreation Use</i>.</p>	<p><u>Class A:</u></p> <ul style="list-style-type: none"> <li>Fecal coliform bacteria: An arithmetic mean of &lt;20 colony forming units (CFU)/100mL in any representative set of samples and &lt;10% of the samples &gt;100 CFU/100mL.</li> </ul> <p><u>Class B:</u></p> <ul style="list-style-type: none"> <li>At public bathing beaches, as defined by MDPH, where <i>E. coli</i> is the chosen indicator: No single <i>E. coli</i> sample shall exceed 235 <i>E. coli</i> /100 mL and the geometric mean of the most recent five <i>E. coli</i> samples within the same bathing season shall not exceed 126 <i>E. coli</i> / 100 mL.</li> <li>At public bathing beaches, as defined by MDPH, where <i>Enterococci</i> are the chosen indicator: No single <i>Enterococci</i> sample shall exceed 61 <i>Enterococci</i> /100mL and the geometric mean of the most recent five <i>Enterococci</i> samples within same bathing season shall not exceed 33 <i>Enterococci</i> /100mL.</li> <li>Current standards for other waters (not designated as bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 CFU/100mL in any representative set of samples, nor shall more than 10% of the samples exceed 400 CFU/100mL. (This criterion may be applied on a seasonal basis at the discretion of the MA DEP.)</li> </ul> <p><u>Class C:</u></p> <ul style="list-style-type: none"> <li>Fecal coliform bacteria: Shall not exceed a geometric mean of 1000 CFU/100mL, nor shall 10% of the samples exceed 2000 CFU/100 mL.</li> </ul> <p><u>Class SA:</u></p> <ul style="list-style-type: none"> <li>Fecal coliform bacteria: Waters approved for open shellfishing shall not exceed a geometric mean (most probable number (MPN) method) of 14 MPN/100 mL, nor shall more than 10% of the samples exceed 43 MPN/100mL.</li> <li>At public bathing beaches, as defined by MDPH, where <i>Enterococci</i> are the chosen indicator: No single <i>Enterococci</i> sample shall exceed 104 <i>Enterococci</i> /100mL and the geometric mean of the five most recent <i>Enterococci</i> levels within the same bathing season shall not exceed 35 <i>Enterococci</i> /100mL.</li> <li>Current standards for other waters (not designated as shellfishing areas or public bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 CFU/100mL in any representative set of samples, nor shall more than 10% of the samples exceed 400 CFU/100mL. (This criterion may be applied on a seasonal basis at the discretion of the MA DEP.)</li> </ul> <p><u>Class SB:</u></p> <ul style="list-style-type: none"> <li>Fecal coliform bacteria: In waters approved for restricted shellfish, a fecal coliform median or geometric mean (MPN method) of &lt;88 MPN/100mL and &lt;10% of the samples &gt;260 MPN/100mL.</li> <li>At public bathing beaches, as defined by MDPH, where <i>Enterococci</i> are the chosen indicator: No single <i>Enterococci</i> sample shall exceed 104 <i>Enterococci</i> /100mL and the geometric mean of the most recent five <i>Enterococci</i> levels within the same bathing season shall not exceed 35 <i>Enterococci</i> /100mL.</li> <li>Current standards for other waters (not designated as shellfishing areas or public bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 CFU/100mL in any representative set of samples, nor shall more than 10% of the samples exceed 400 CFU/100mL. (This criterion may be applied on a seasonal basis at the discretion of the MA DEP.)</li> </ul> <p><u>Class SC:</u></p> <ul style="list-style-type: none"> <li>Fecal coliform bacteria: Shall not exceed a geometric mean of 1000 CFU/100mL, nor shall 10% of the samples exceed 2000 CFU/100mL.</li> </ul>
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## DESIGNATED USES

The Massachusetts Surface Water Quality Standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected. Each of these uses is briefly described below (MA DEP 1996).

- *AQUATIC LIFE* - suitable habitat for sustaining a native, naturally diverse, community of aquatic flora and fauna. Two subclasses of aquatic life are also designated in the standards for freshwater bodies: *Cold Water Fishery* - capable of sustaining a year-round population of cold water aquatic life, such as trout; *Warm Water Fishery* - waters that are not capable of sustaining a year-round population of cold water aquatic life.
- *FISH CONSUMPTION* - pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, other aquatic life or wildlife for human consumption.
- *DRINKING WATER* - used to denote those waters used as a source of public drinking water. They may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). These waters are designated for protection as Outstanding Resource Waters under 314 CMR 4.04(3).
- *SHELLFISH HARVESTING* (in SA and SB segments) – Class SA waters in approved areas (Open Shellfish Areas) shellfish harvested without depuration shall be suitable for consumption; Class SB waters in approved areas (Restricted Shellfish Areas) shellfish harvested with depuration shall be suitable for consumption.
- *PRIMARY CONTACT RECREATION* - suitable for any recreation or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water. These include, but are not limited to, wading, swimming, diving, surfing and water skiing.
- *SECONDARY CONTACT RECREATION* - suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities.
- *AESTHETICS* - all surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.
- *AGRICULTURAL AND INDUSTRIAL* - suitable for irrigation or other agricultural process water and for compatible industrial cooling and process water.

The guidance used to assess the *Aquatic Life*, *Fish Consumption*, *Drinking Water*, *Shellfish Harvesting*, *Primary* and *Secondary Contact Recreation* and *Aesthetics* uses follows. The status of the *Agricultural and Industrial Use* is not reported to EPA.

## AQUATIC LIFE USE

This use is suitable for sustaining a native, naturally diverse, community of aquatic flora and fauna. The results of biological (and habitat), toxicological, and chemical data are integrated to assess this use. The nature, frequency, and precision of the MA DEP's data collection techniques dictate that a weight of evidence be used to make the assessment, with biosurvey results used as the final arbiter of borderline cases. The following chart provides an overview of the guidance used to assess the status (support or impaired) of the *Aquatic Life Use*:

<b>Variable</b>	<b>Support</b> - Data available clearly indicates support or minor modification of the biological community. Excursions from chemical criteria (Table 1) not frequent or prolonged and may be tolerated if the biosurvey results demonstrate support.	<b>Impaired</b> There are frequent or severe violations of chemical criteria, presence of acute toxicity, or a moderate or severe modification of the biological community.
<b>BIOLOGY</b>		
Rapid Bioassessment Protocol III* (RBP III)	Non or Slightly impacted	Moderately or Severely Impacted
Fish Community	Best Professional Judgment (BPJ)	BPJ
Habitat and Flow	BPJ	Dewatered streambed due to artificial regulation or channel alteration, BPJ
Eelgrass Bed Habitat (Howes et al. 2002)	Stable (No/Minimal loss), BPJ	Loss/Decline, BPJ
Macrophytes	BPJ	Exotic species present, BPJ
Plankton/Periphyton	No/infrequent algal blooms	Frequent and/or prolonged algal blooms
<b>TOXICITY TESTS**</b>		
Water Column/Ambient	≥75% survival either 48 hr or 7-day exposure	<75% survival either 48 hr or 7-day exposure
Sediment	≥75% survival	<75% survival
<b>CHEMISTRY-WATER**</b>		
Dissolved oxygen (DO)/percent saturation (MA DEP 1996, EPA 1997)	Infrequent excursion from criteria (Table 1), BPJ (minimum of three samples representing critical period)	Frequent and/or prolonged excursion from criteria [river and shallow lakes: exceedances >10% of measurements; deep lakes (with hypolimnion): exceedances in the hypolimnetic area >10% of the surface area].
pH (MA DEP 1996, EPA 1999a)	Infrequent excursion from criteria (Table 1)	Criteria exceeded >10% of measurements.
Temperature (MA DEP 1996, EPA 1997)	Infrequent excursion from criteria (Table 1) <sup>1</sup>	Criteria exceeded >10% of measurements.
Toxic Pollutants (MA DEP 1996, EPA 1999a) Ammonia-N (MA DEP 1996, EPA 1999b) Chlorine (MA DEP 1996, EPA 1999a)	Infrequent excursion from criteria (Table 1) Ammonia is pH and temperature dependent <sup>2</sup> 0.011 mg/L (freshwater) or 0.0075 mg/L (saltwater) total residual chlorine (TRC) <sup>3</sup>	Frequent and/or prolonged excursion from criteria (exceeded >10% of measurements).
<b>CHEMISTRY-SEDIMENT**</b>		
Toxic Pollutants (Persaud et al. 1993)	Concentrations ≤ Low Effect Level (L-EL), BPJ	Concentrations ≥ Severe Effect Level (S-EL) <sup>4</sup> , BPJ
<b>CHEMISTRY-TISSUE</b>		
PCB – whole fish (Coles 1998)	≤500 µg/kg wet weight	BPJ
DDT (Environment Canada 1999)	≤14.0 µg/kg wet weight	BPJ
PCB in aquatic tissue (Environment Canada 1999)	≤0.79 ng TEQ/kg wet weight	BPJ

\*RBP II analysis may be considered for assessment decision on a case-by-case basis, \*\*For identification of impairment, one or more of the following variables may be used to identify possible causes/sources of impairment: NPDES facility compliance with whole effluent toxicity test and other limits, turbidity and suspended solids data, nutrient (nitrogen and phosphorus) data for water column/sediments. <sup>1</sup>Maximum daily mean T in a month (minimum six measurements evenly distributed over 24-hours) less than criterion. <sup>2</sup>Saltwater is temperature dependent only. <sup>3</sup>The minimum quantification level for TRC is 0.05 mg/L. <sup>4</sup>For the purpose of this report, the S-EL for total polychlorinated biphenyl compounds (PCB) in sediment (which varies with Total Organic Carbon (TOC) content) with 1% TOC is 5.3 ppm while a sediment sample with 10% TOC is 53 ppm.

Note: National Academy of Sciences/National Academy of Engineering (NAS/NAE) guideline for maximum organochlorine concentrations (i.e., total PCB) in fish tissue for the protection of fish-eating wildlife is 500µg/kg wet weight (ppb, not lipid-normalized). PCB data (tissue) in this report are presented in µg/kg wet weight (ppb) and are not lipid-normalized to allow for direct comparison to the NAS/NAE guideline.



## **FISH CONSUMPTION USE**

Pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, other aquatic life or wildlife for human consumption. The assessment of this use is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MDPH), Bureau of Environmental Health Assessment (MDPH 2002a). The MDPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species pose a health risk for human consumption. Hence, the Fish Consumption Use is assessed as non-support in these waters.

In July 2001, MDPH issued new consumer advisories on fish consumption and mercury contamination (MDPH 2001).

1. The MDPH "...is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MDPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age."
2. Additionally, MDPH "...is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury."

Other statewide advisories that MDPH has previously issued and are still in effect are as follows (MDPH 2001):

1. "Due to concerns about chemical contamination, primarily from polychlorinated biphenyl compounds (PCBs) and other contaminants, no individual should consume lobster tomalley from any source. Lobster tomalley is the soft green substance found in the tail and body section of the lobster.
2. Pregnant and breastfeeding women and those who are considering becoming pregnant should not eat bluefish due to concerns about PCB contamination in this species."

The following is an overview of EPA's guidance used to assess the status (support or impaired) of the *Fish Consumption Use*. Because of the statewide advisory no waters can be assessed as support for the *Fish Consumption Use*. Therefore, if no site-specific advisory is in place, the *Fish Consumption Use* is not assessed.

<b>Variable</b>	<b>Support</b> No restrictions or bans in effect	<b>Impaired</b> There is a "no consumption" advisory or ban in effect for the general population or a sub-population for one or more fish species or there is a commercial fishing ban in effect
MDPH Fish Consumption Advisory List (MDPH 2001, MDPH 2002a)	Not applicable, precluded by statewide advisory (mercury and/or PCB)	Waterbody on MDPH Fish Consumption Advisory List

Note: MDPH's statewide advisory does not include fish stocked by the Massachusetts Division of Fisheries and Wildlife or farm-raised fish sold commercially.



## **DRINKING WATER USE**

The term *Drinking Water Use* denotes those waters used as a source of public drinking water. These waters may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). They are designated for protection as Outstanding Resource Waters in 314 CMR 4.04(3). MA DEP's Drinking Water Program (DWP) has primacy for implementing the provisions of the federal Safe Drinking Water Act (SDWA). Except for suppliers with surface water sources for which a waiver from filtration has been granted (these systems also monitor surface water quality) all public drinking water supplies are monitored as finished water (tap water). Monitoring includes the major categories of contaminants established in the SDWA: bacteria, volatile and synthetic organic compounds, inorganic compounds and radionuclides. The DWP maintains current drinking supply monitoring data. The status of the supplies is currently reported to MA DEP and EPA by the suppliers on an annual basis in the form of a consumer confidence report (<http://yosemite.epa.gov/ogwdw/ccr.nsf/Massachusetts>). Below is EPA's guidance to assess the status (support or impaired) of the drinking water use.

<b>Variable</b>	<b>Support</b>	<b>Impaired</b>
	No closures or advisories (no contaminants with confirmed exceedances of maximum contaminant levels, conventional treatment is adequate to maintain the supply).	Has one or more advisories or more than conventional treatment is required or has a contamination-based closure of the water supply.
Drinking Water Program (DWP) Evaluation	See note below	See note below

Note: While this use is not assessed in this report, information on drinking water source protection and finish water quality is available at <http://www.state.ma.us/dep/brp/dws/dwshome.htm> and from the Islands Watershed's public water suppliers.

## **SHELLFISH HARVESTING USE**

This use is assessed using information from the Department of Fisheries, Wildlife and Environmental Law Enforcement's Division of Marine Fisheries (DMF). A designated shellfish growing area is an area of potential shellfish habitat. Growing areas are managed with respect to shellfish harvest for direct human consumption, and comprise at least one or more classification areas. The classification areas are the management units that range from being approved to prohibited (described below) with respect to shellfish harvest. Shellfish areas under management closures are *not assessed*. Not enough testing has been done in these areas to determine whether or not they are fit for shellfish harvest, therefore, they are closed for the harvest of shellfish.

<b>Variable</b>	<b>Support</b>	<b>Impaired</b>
	SA Waters: Approved <sup>1</sup> SB Waters: Approved <sup>1</sup> , Conditionally Approved <sup>2</sup> or Restricted <sup>3</sup>	SA Waters: Conditionally Approved <sup>2</sup> , Restricted <sup>3</sup> , Conditionally Restricted <sup>4</sup> , or Prohibited <sup>5</sup> SB Waters: Conditionally Restricted <sup>4</sup> or Prohibited <sup>5</sup>
DMF Shellfish Project Classification Area Information (DFWELE 2000)	Reported by DMF	Reported by DMF

NOTE: Designated shellfish growing areas may be viewed using the MassGIS datalayer available from MassGIS at <http://www.state.ma.us/mgis/dsga.htm>. This coverage reflects classification areas as of July 1, 2000.

<sup>1</sup> **Approved** - "...open for harvest of shellfish for direct human consumption subject to local rules and regulations..."

An approved area is open all the time and closes only due to hurricanes or other major coastwide events.

<sup>2</sup> **Conditionally Approved** - "...subject to intermittent microbiological pollution..." During the time the area is open, it is "...for harvest of shellfish for direct human consumption subject to local rules and regulations..." A conditionally approved area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, shellfish harvested are treated as from an approved area.

<sup>3</sup> **Restricted** - area contains a "limited degree of pollution." It is open for "harvest of shellfish with depuration subject to local rules and state regulations" or for the relay of shellfish. A restricted area is used by DMF for the relay of shellfish to a less contaminated area.

<sup>4</sup> **Conditionally Restricted** - "...subject to intermittent microbiological pollution..." During the time area is restricted, it is only open for "the harvest of shellfish with depuration subject to local rules and state regulations." A conditionally restricted area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, only soft-shell clams may be harvested by specially licensed diggers (Master/Subordinate Diggers) and transported to the DMF Shellfish Purification Plant for depuration (purification).

<sup>5</sup> **Prohibited** - Closed for harvest of shellfish.



## PRIMARY CONTACT RECREATION USE

This use is suitable for any recreational or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water during the primary contact recreation season (1 April to 15 October). These include, but are not limited to, wading, swimming, diving, surfing and water skiing. The chart below provides an overview of the guidance used to assess the status (support or impaired) of the *Primary Contact Recreation Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

<b>Variable</b>	<b>Support</b> Criteria are met, no aesthetic conditions that preclude the use	<b>Impaired</b> Frequent or prolonged violations of criteria and/or formal bathing area closures, or severe aesthetic conditions that preclude the use
Bacteria (MDPH 2002b) Minimum Standards for Bathing Beaches State Sanitary Code and MADEP 1996	At "public bathing beach" areas: Formal beach postings/advisories neither frequent nor prolonged during the swimming season (the number of days posted or closed cannot exceed 10% during the locally operated swimming season).  Other waters: Samples* collected during the primary contact season must meet criteria (Table 1).  Shellfish Growing Area classified as "Approved" by DMF.	At "public bathing beach" areas: Formal beach closures/postings >10% of time during swimming season (the number of days posted or closed exceeds 10% during the locally operated swimming season).  Other waters: Samples* collected during the primary contact season do not meet the criteria (Table 1).
Aesthetics (MA DEP 1996) - <i>All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance [growth or amount] species of aquatic life</i>		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MDPH 1969)	Public bathing beach and lakes – Secchi disk depth $\geq 1.2$ meters ( $\geq 4'$ ) (minimum of three samples representing critical period*).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period*).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms) rendering the water aesthetically objectionable and/or unusable, BPJ.

\*Data sets to be evaluated for assessment purposes must be representative of a sampling location (minimum of five samples per station recommended) over the course of the primary contact season. Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use. An impairment decision will not be based on a single sample (i.e., the geometric mean of five samples is <200 CFU/100mL but one of the five samples exceeds 400 CFU/100mL). The method detection limit (MDL) will be used in the calculation of the geometric mean when data are reported as less than the MDL (e.g. use 20 CFU/100mL if the result is reported as <20 CFU/100mL). Those data reported as too numerous to count (TNTC) will not be used in the geometric mean calculation; however frequency of TNTC sample results should be presented.

## SECONDARY CONTACT RECREATION USE

This use is suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities. Following is an overview of the guidance used to assess the status (support or impaired) of the *Secondary Contact Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

<b>Variable</b>	<b>Support</b> Criteria are met, no aesthetic conditions that preclude the use	<b>Impaired</b> Frequent or prolonged violations of criteria, or severe aesthetic conditions that preclude the use
Fecal Coliform Bacteria (MA DEP 1996)	Other waters: Samples* collected must meet the Class C or SC criteria (see Table 1).	Other waters: Samples* collected do not meet the Class C or SC criteria (see Table 1).
<i>Aesthetics (MA DEP 1996) - All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance [growth or amount] species of aquatic life</i>		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms) rendering the water aesthetically objectionable and/or unusable, BPJ.

\*Data sets to be evaluated for assessment purposes must be representative of a sampling location (minimum of five samples per station recommended) over time. Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use.

## AESTHETICS USE

All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. The aesthetic use is closely tied to the public health aspects of the recreational uses (swimming and boating). Below is an overview of the guidance used to assess the status (support or impaired) of the *Aesthetics Use*.

<b>Variable</b>	<b>Support</b> Narrative "free from" criteria met	<b>Impaired</b> Objectionable conditions frequent and/or prolonged
Aesthetics (MA DEP 1996) Visual observations	Narrative "free from" criteria met, BPJ ( $\leq 10\%$ extent of spatial and temporal degradation).	Narrative "free from" criteria not met, BPJ ( $> 10\%$ extent of spatial and temporal degradation).



## ISLANDS WATERSHED DESCRIPTION AND CLASSIFICATION

### DESCRIPTION

The Islands Watershed (or coastal drainage area) includes the Elizabeth Islands, Nantucket and Martha's Vineyard (Figure 3). The Elizabeth Islands are a chain of fifteen islands encompassing 13.6 square miles with approximately 54 miles of tidal shoreline in the town of Gosnold, Dukes County. One family owns and manages all but two of the islands (Cuttyhunk and Penikese). Most of the Elizabeth Islands are grassy with areas of low woods or shrub growth.

Martha's Vineyard is a 96 square mile island consisting of six towns: Chilmark, Edgartown, Gay Head, Oak Bluffs, Tisbury, and West Tisbury. Maximum elevation on the island is roughly 300 feet. There are approximately 125 miles of shoreline, ranging from nine miles in West Tisbury to 49 miles in Edgartown. Martha's Vineyard, together with the Town of Gosnold (Elizabeth Islands), forms Dukes County.

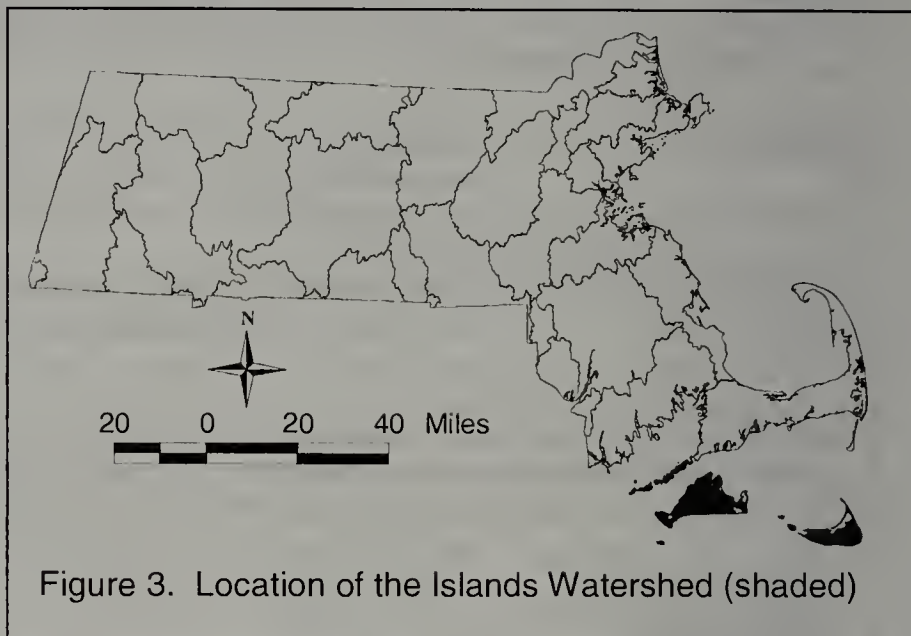


Figure 3. Location of the Islands Watershed (shaded)

The first settlement of Martha's Vineyard was in 1671. Trading, whaling (including the largest sperm-oil candle factory in the world), fishing, salt works, and agricultural activities were the economic base. Today, some farming, fishing, and pottery manufacture remain but tourism is the major component of the economy.

Nantucket is a 49 square mile island surrounded by the Atlantic Ocean. It is a combination of moraines and outwash plain resulting primarily from the last episode of glaciation that affected the Northeast about 15,000 years ago. The Town of Nantucket, which is a county as well, has elevations to about 100 feet above sea level and approximately 94 miles of shoreline.

Nantucket was settled in 1641 with farming and sheep raising as the principal occupations. Eventually, fishing and whaling became the dominant economic activity and, by 1768, the town was port for over 125 whaling vessels. In the early 19th century, the manufacture of wool and nails became major activities. Nantucket's economy today is based primarily on tourism and construction. However, publishing, printing, ship and boat construction and repair, and sand and gravel extraction are also part of the economic base.

On Martha's Vineyard and Nantucket, ponds are the dominant form of surface freshwater resources. However, groundwater is the major freshwater resource that supplies all of the drinking water on the islands. The EPA has designated Martha's Vineyard and Nantucket as sole source aquifers under the Safe Drinking Water Act (EPA 2002a). "After a Sole Source Aquifer is designated, no commitment for federal financial assistance may be provided for any project which the EPA determines may contaminate the aquifer through its recharge area so as to create a significant hazard to public health. An additional benefit of designating an area as a Sole Source Aquifer is the increased public awareness of the nature and value of local ground water resources. Local residents and businesses may be more willing to protect an aquifer through local action if they learn their drinking water originates from a vulnerable underground supply."

Groundwater is also the receiving waterbody for effluent from the existing municipal wastewater treatment facilities (Edgartown and Nantucket) as well as the individual subsurface systems on both Martha's Vineyard and Nantucket. In addition to freshwater, the Islands have extensive marine and brackish water resources. Activities range from boating and swimming to shellfish harvesting.



## CLASSIFICATION

Consistent with the National Goal Uses of "fishable and swimmable waters", the classification of waters in the Islands Watershed according to the SWQS, include the following (MA DEP 1996):

"Class SA – These waters are designated as an excellent habitat for fish, other aquatic life and wildlife and for primary and secondary recreation. In approved areas they shall be suitable for shellfish harvesting without depuration (Open Shellfishing Areas). These waters shall have excellent aesthetic value. These waters are designated for protection as ORW under 314 CMR 4.04(3)" (Rojko *et al.* 1995).

The following areas are classified as SA in the Islands Watershed:

- surface waters adjacent (area within 1,000 feet seaward of mean low water) to the Elizabeth Islands subject to the rise and fall of the tide (ORW), and
- all surface waters subject to the rise and fall of the tide of Dukes County and Nantucket Drainage Areas.

The Massachusetts Surface Water Quality Standards contain antidegradation provisions (314 CMR 4.04) to maintain existing uses and the level of water quality necessary to protect those uses. As part of these provisions, waters with exceptional socio-economic, recreational, ecological and/or aesthetic values are designed as Outstanding Resource Waters (ORWs) (Rojko *et al.* 1995). ORWs include vernal pools, certified as such by the Natural Heritage Program of the Massachusetts Division of Fisheries and Wildlife, and all designated Class A Public Water Supplies (PWSs). Other waters designated as ORWs may include those found in National Parks, State Forests and Parks, and Areas of Critical Environmental Concern (ACECs) designated by the Secretary of Environmental Affairs and those protected by special legislation (MA DEM 1993). Wetlands which border these ORWs are designated ORWs to the boundary of the defined area.

ORWs have more stringent requirements than other waters because the existing use is so exceptional or the perceived risk of harm is such that no lowering of water quality is permissible. Generally, new or increased discharges of pollutants are prohibited for wastewater and stormwater. The discharge of dredge or fill material to a certified vernal pool and within 500 feet of a water supply reservoir is prohibited unless a variance is granted under 314 CMR 9.00 (401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging and Dredged Material Disposal in Waters of the United States within the Commonwealth). The discharge of dredged or fill material into other ORWs is permitted for certain specified projects only after an alternatives analysis and minimization and mitigation of adverse impacts.

Within the Islands Watershed, specific waterbody areas protected as ORWs include Canapitsit Channel, Cuttyhunk Harbor, French Watering Place, Hadley Harbor, Inner Harbor, Kettle Cove, Lackeys Bay, Monsod Bay, Northwest Gutter, Quicks Hole, Robinsons Hole, Sheep Pen Harbor, Tarpaulin Cove and Vineyard Sound. All are located in the Town of Gosnold.

Unlisted waters in the Islands Watershed, not otherwise designated in the SWQS, are designated *Class B, High Quality Waters* for inland waters and *Class SA, High Quality Waters* for coastal and marine waters. According to the SWQS, where fisheries designations are necessary, they shall be made on a case-by-case basis.

## SUMMARY OF EXISTING CONDITIONS AND PERCEIVED PROBLEMS

According to the Commonwealth of Massachusetts Summary of Water Quality 1992, Appendix I Basin/Segment Information, water quality impairment in the Islands Watershed was due primarily to the presence of pathogens as measured by fecal coliform bacteria (MA DEP 1993). Sources of these contaminants, when known, included urban and non-urban runoff, onsite wastewater systems, marinas, and recreational activities.

The Clean Water Act Section 303(d) requires states to identify those waterbodies that are not meeting standards and prioritize the development of TMDLs for these waterbodies. Table 2 identifies the waterbodies in the Islands Watershed on the most recent, EPA approved, 1998 Massachusetts Section 303(d) List of Waters (MA DEP 1999).



Table 2. Massachusetts 1998 Section 303(d) List of Waters in the Islands Watershed

Name	Location	Cause of Impairment
Nantucket Harbor (MA97-01)	Nantucket	Nutrients, Pathogens, Noxious aquatic plants
Sesachacha Pond (MA97-02)	Nantucket	Pathogens
Chilmark Pond (MA97-05)	Chilmark, Martha's Vineyard	Pathogens
Edgartown Harbor (MA97-15)	Edgartown, Martha's Vineyard	Pathogens
Menemsha Pond (MA97-06)	Gay Head, Martha's Vineyard	Pathogens
Oak Bluffs Harbor (MA97-07)	Oak Bluffs, Martha's Vineyard	Pathogens
Oyster Pond (MA97-13)	Edgartown, Martha's Vineyard	Pathogens
Sengekontacket Pond (MA97-10)	Edgartown, Martha's Vineyard	Pathogens
Tisbury Great Pond (MA97-18)	West Tisbury, Martha's Vineyard	Pathogens
Vineyard Haven Harbor (MA97-09)	Tisbury/Oak Bluffs, Martha's Vineyard	Pathogens
Cuttyhunk Pond (MA97-21)	Gosnold, Elizabeth Islands	Pathogens
Westend Pond (MA97-20)	Gosnold, Elizabeth Islands	Pathogens

All freshwaters in Massachusetts are technically (by default) listed in 1998 as Section 303(d) waters with mercury as the associated stressor/pollutant due to the 1994 MDPH Interim Freshwater Fish Consumption Advisory. This fish consumption advisory was aimed at pregnant women only; the general public was not considered to be at risk from fish consumption and encompassed all freshwaters in Massachusetts (MDPH 1994).

In July 2001, MDPH issued a new, more inclusive, fish consumption advisory for both fresh and salt waters in the Commonwealth (MDPH 2001). Within the last decade, the northeastern United States has been identified as receiving elevated rates of mercury deposition from the atmosphere and high levels of mercury contamination in non-commercial freshwater fish (Tatsutani 1998). Mercury is a trace metal that exists in the earth's crust. It is a toxicant that, once mobilized in the environment, can be transformed into methylmercury, a particularly toxic form that can bioaccumulate. Most of the mercury contamination in the northeastern United States has been linked to air emissions (incinerators, fossil fuel combustion facilities) from both local and mid-western sources.

Currently there are MDPH fish consumption advisories for three waterbodies in the Islands Watershed (all on Nantucket) because of elevated levels of mercury (MDPH 2002a); Gibbs Pond, Miacomet Pond, and Tom Nevers Pond.

Gibbs Pond (MA97028, Nantucket)

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Gibbs Pond."
2. "The general public should limit consumption of all fish from Gibbs Pond to two meals per month."

Miacomet Pond (MA97055, Nantucket)

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Miacomet Pond."
2. "The general public should not consume any white perch caught from Miacomet Pond."
3. "The general public should limit consumption of non-affected fish species from Miacomet Pond to two meals per month."

Tom Nevers Pond (MA97097, Nantucket)

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Tom Nevers Pond."
2. "The general public should limit consumption of all fish from Tom Nevers Pond to two meals per month."



## SOURCES OF INFORMATION

Multiple local, state and federal agencies provided information used in the water quality assessment of the Islands Watershed. Within the Department of Environmental Protection (MA DEP) information was obtained from the Bureau of Resource Protection (BRP). Specifically, biological data and habitat assessments (Appendix A) and toxics in fish flesh data (Appendix B) were provided by the MA DEP BRP Division of Watershed Management (DWM) Watershed Planning Program. Water withdrawal (Appendix C) and wastewater discharge permit information was provided by the DWM Watershed Permitting Program (Water Management Act and National Pollutant Discharge Elimination System) and the MA DEP Southeast Regional Office Islands Watershed Team. [Note: The BRP DWM Drinking Water Program evaluates the status of the *Drinking Water Use* and this information is, therefore, not provided in this assessment report.] Projects funded through various MA DEP grant and loan programs also provide valuable information that may be used in the water quality assessment report. A summary of these projects for the Islands Watershed is provided in Appendix D.

The following types of National Pollutant Discharge Elimination System (NPDES) surface water discharges occur in the Islands Watershed (Appendix C, Table C1) (MA DEP 2003):

### *Sanitary wastewater.*

The Town of Gosnold operates a wastewater treatment plant that discharges primary effluent through one outfall to Vineyard Sound. This facility obtained a Section 301(h) waiver that exempts the facility from secondary treatment of wastewater. The NPDES permit (MA0100081) was issued on 30 September 1986 and is scheduled to be reissued in 2003. Average monthly flow from the facility is permitted for 0.031 million gallons per day (MGD). In addition to other permit limitations and requirements, the average monthly biochemical oxygen demand (BOD) concentration is 144 mg/L and average monthly total suspended solids (TSS) concentration is 44 mg/L. The maximum daily settleable solids concentration cannot exceed 0.3 ml/L and the average weekly concentration cannot exceed 0.1 ml/L. Maximum daily total coliform concentrations cannot exceed 230 MPN/100mL and the average monthly concentration cannot exceed 70 MPN/100mL.

USCG-Menemsha operates a wastewater treatment plant that discharges treated effluent to Fresh Pond. The NPDES permit (MA0090590) expired on May 31, 1984 and is scheduled to be reissued in 2003. Average monthly flow in the expired permit is limited to 0.030 MGD. In addition to other permit limitations and requirements, the daily maximum BOD and TSS concentrations cannot exceed 50 mg/L. Weekly average concentrations for both parameters cannot exceed 30 mg/L, and monthly average concentrations cannot exceed 25 mg/L. The daily maximum concentration and weekly and monthly average concentrations for fecal coliform is 15 colonies/100mL.

The Town of Nantucket operates two Class III wastewater treatment plants that discharge treated effluent to the ground (Burns 2003). Surfside is an enhanced primary treatment system with an average summer flow of 1.8 MGD. The Surfside permit (SE# 1-200) was issued on 14 March 1992 and has Class III requirements with the following limits: biochemical oxygen demand (5-day)  $\leq 215$ mg/L, TSS  $\leq 225$  mg/L, and oil and grease  $\leq 15$ mg/L. Additionally, Surfside is required to perform quarterly monitoring of Class III monitoring wells for ammonia, nitrate-n, total nitrogen, surfactants, total coliform and water level. The Surfside facility is currently being evaluated as part of an Island-wide Comprehensive Water Resource Management Plan.

Siasconset is a sewage bed treatment facility currently under construction to upgrade the facility (Burns 2003). The Siasconset permit (SE #1-201) was issued on 9 August 2001 and has an average summer flow of 260,000 gallons per day (GPD). Permit limits for the new Siasconset facility (under construction) include: BOD  $\leq 30$ mg/L, TSS  $\leq 30$ mg/L, nitrate  $\leq 10$ mg/L, total nitrogen  $\leq 10$ mg/L, and fecal coliform bacteria  $\leq 200$ /100mL.

Edgartown Wastewater Treatment Facility has a groundwater discharge permit (SE #2-24) issued 5 May 1999 and expires 5 April 2004 (Mezzacappa 2003). The original secondary wastewater plant was built in 1972 and was designed for 0.25 MGD (Water-Wastewater Web 2003). Increased summertime flows exceeding 0.40 MGD initiated an extensive upgrade to the facility. The startup date for the new facility was 22 April 1996 with a seasonal discharge rate ranging from 6,000 GPD to 230,00 GPD.



Although no towns in the Islands Watershed are Phase II stormwater communities, the Oak Bluffs Board of Health has adopted "Stormwater Management Regulations" that accomplish the same goals as Phase II (MVC 2000). The regulations are intended to... "properly manage stormwater by providing adequate protection against pollutants, flooding, siltation, and other drainage problems. The regulations apply to all new construction and alteration in Sensitive Resource Areas, and provide for development of a stormwater management design and plan so that the drainage for the subdivision or project shall not cause an increase or decrease in the volume of runoff discharged off site, for storms of 1, 10, 50 and 100 year frequency."

A list of registered and permitted Water Management Act (WMA) withdrawals (both public water suppliers and other industrial users) is provided in Appendix C Table C1 (Levangie 2002). Registration and permit files (both public water suppliers and other industrial users) were reviewed to determine where pond, estuary or river segments might be affected by water withdrawal activities. The information is summarized in the segments where the withdrawals occur.

Other state agencies contributing information to this report include: the Massachusetts Department of Public Health (MDPH), and the Department of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE), Division of Marine Fisheries (DMF) and Division of Fisheries and Wildlife (MassWildlife). Federal agencies contributing include the EPA and United States Geological Survey (USGS).

In August 2001, the Massachusetts "Beach Bill" was enacted by the legislature and signed by the Governor (MGL. C111. S5S). This act created minimum standards for public bathing waters adjacent to any public or semi-public bathing beach in the Commonwealth. A "public bathing beach" is defined as a beach open to the general public whether or not any entry fee is charged that permits access to bathing waters. A "semi-public bathing beach" is defined as a bathing beach used in connection with a hotel, motel, trailer park, campground, apartment house, condominium, country club, youth club, school, camp, or similar establishment where the primary purpose of the establishment is not the operation of the bathing beach, and where admission to the use of the bathing beach is included in the fee paid for use of the premises. A semi-public bathing beach shall also include a bathing beach operated and maintained solely for the use of members and guests of an organization that maintains such bathing beach. Under the Beach Bill, the Massachusetts Department of Public Health (MDPH) was directed to establish minimum uniform water quality standards for coastal and inland beach waters as well as determining the frequency and location of testing, reporting requirements, and requirements for notifying the public of threats to human health or safety. *105 CMR 445.000: Minimum Standards for Bathing Beaches, State Sanitary Code, Chapter VII* outlines MDPH's guidelines for the Beach Bill and is available online at [http://www.state.ma.us/dph/dcs/bb4\\_01.pdf](http://www.state.ma.us/dph/dcs/bb4_01.pdf) (MDPH 2002b). Additionally, under the Beach Bill and MDPH guidelines, local boards of health and state agencies are responsible for collecting samples from public beaches using testing procedures consistent with the American Public Health Association's *Standard Methods for Examination of Water and Waste Water* or methods approved by EPA. Operators of semi-public beaches are responsible for the costs of testing their beaches. Results of testing, monitoring, and analysis of public and semi-public beaches must be submitted in an annual report to MDPH by 31 October of each year.

The National Shellfish Sanitation Program (NSSP) includes federal and state governments cooperatively administering a battery of public health regulations designed to assure the sanitary integrity of shellfish and shellfish products (ISSC 2000). A key regulatory role assigned to coastal states by the NSSP is shellfish classification. According to methods, procedures and standards set forth in the NSSP *Guide For The Control Of Molluscan Shellfish*, a designated state agency must determine whether shellfish from coastal growing waters are safe or may be made safe for human consumption. The determination is based, in large part, upon the presence of fecal coliform bacteria within the growing waters.

In Massachusetts, the Division of Marine Fisheries (DMF) Shellfish Management Program maintains information used to classify (e.g., approved, conditionally approved, prohibited, etc.) their shellfish management areas (DFWELE 2000). These classifications are subsequently used to regulate the harvesting of various shellfish. DMF shellfish management areas include acreage in the Islands Watershed not specifically designated as a segment in this report. Appendix E includes the complete listing of DMF shellfishing closures as of July 2000 in the Islands Watershed.



DMF achieves public health protection as a result of their sanitary surveys of shellfish growing areas to determine each area's suitability as shellfish sources for human consumption (DFWELE 2002a). "The principal components of a sanitary survey include: 1) an evaluation of pollution sources that may affect an area; 2) evaluation of hydrographic and meteorological characteristics that may affect distribution of pollutants; and 3) an assessment of water quality." These surveys also include shellfish species identification, habitat location, relative abundance and documentation of related fisheries (Kennedy 2001). Supplementary analysis may be required for naturally occurring pathogens (e.g., *Vibrio* spp.), marine biotoxins (e.g., Paralytic Shellfish Poisoning) as well as hazardous wastes in growing areas with a known history of contamination by these harmful substances.

"Each growing area must have a complete sanitary survey every twelve years, a triennial evaluation every three years and an annual review in order to maintain a classification, which allows shellfish harvesting (DFWELE 2002a). Minimum requirements for sanitary surveys, triennial evaluations, annual reviews and annual water quality monitoring are established by the Interstate Shellfish Sanitation Conference (ISSC) and set forth in the NSSP. Each year water samples are collected at 2,320 stations in 294 growing areas in Massachusetts's coastal waters at a minimum frequency of five times while open to harvesting. Water and shellfish samples are tested for fecal coliform bacteria at two *Marine Fisheries* laboratories located in Gloucester and Pocasset using a Most Probable Number method for classification purposes and a membrane filtration technique (usually M-tec) for pollution source identification." A growing area classification may be downgraded and management plans amended, based on the findings of annual and triennial reviews (Kennedy 2001). Classification upgrades can only be made based on the findings of a full sanitary survey.

DFWELE's Division of Fisheries and Wildlife (MassWildlife) performs fish population monitoring in selected watersheds each summer. In 2000, MassWildlife performed monitoring on four brooks and one pond in the Islands Watershed: Mill Brook, Roaring Brook, Smith Brook, Black Brook and West End Pond.

"MA DEP and the UMASS/Dartmouth School of Marine Science and Technology (SMAST) are stepping up a collaborative project with [EPA], Coastal Zone Management, the Cape Cod Commission and several municipalities to classify the nitrogen sensitivity of southeastern Massachusetts's coastal bays and estuaries in the Massachusetts Estuaries Project (MA DEP 2002a). SMAST technical experts will work with MA DEP to evaluate the nitrogen sensitivity through comprehensive water quality testing, quantitative TMDL modeling, and preparation of technical reports allowing communities to consider how implementation of nitrogen management scenarios within watersheds will influence water quality in embayments. The major project goals are to: (1) develop a coastal TMDL working group for coordination and rapid transfer of results, (2) determine the nutrient [and bacteria] sensitivity of each of the 89 embayments in southeastern Massachusetts, (3) provide necessary data collection and analysis required for quantitative modeling, (4) conduct quantitative TMDL analysis, outreach, and planning, and (5) keep each embayment's model "alive" to address future regulatory needs (MA DEP 2002b)."

"The Estuaries Project is comprised of four phases relating to project design, project development, implementation of approach, and application of management models to on-going management issues (MA DEP 2002b). The project phases are further described as:

- *Phase I* - Assemble a working group, design the project organizational framework, evaluate existing management models and select appropriate approach for regional implementation, and survey existing data sources with regard to potential to support selected approach;
- *Phase II* - Determine the prioritization procedure and select initial embayments, promote water quality data collection in embayments with insufficient baseline data, educate local stakeholders as to Project goals, approach, results and data needs and complete the assessment of existing data and data gaps. Also, establish necessary regulatory stakeholder committees and increase the analytical capability of the Project Team relative to collection of field data needed to support the management approach;
- *Phase III* - Implement embayment management approach on a 2-year cycle, which includes field data collection, modeling, reporting, and a significant level of public outreach. Year 1 focuses on site-specific data collection to fill data gaps, Year 2 focuses on modeling, synthesis, and evaluation of management options; and



- *Phase IV* - Keep quantitative models and embayment specific management approaches "alive" for future DEP and other management/planning needs and to provide a platform (upon request) for tracking embayment changes."

In addition to state and federal agencies, regional and local groups provide watershed management information, which may be used to indicate areas of both high and degraded water quality, as well as causes and sources of contamination.

One regional organization in the Islands Watershed that is integral to watershed management on Martha's Vineyard is the Martha's Vineyard Commission (MVC).

"The Martha's Vineyard Commission, established in 1974, was the first regional land-use planning agency in the State with regulatory powers (VCS 2003). It is a regional planning agency for Dukes County, including the islands of Martha's Vineyard and Gosnold (Cuttyhunk). Its purposes are (1) to help the towns regulate development in fragile areas, using standards set by the Commission with state approval (Districts of Critical Planning Concern); (2) to regulate changes affecting more than one town because of location, size, or type (Developments of Regional Impact); and (3) to promote public services and economic activities suited to the Island's resources and ecology."

Since 1993 the Town of Nantucket's Marine and Coastal Resource Department has been monitoring water quality in Hummock Pond, Miacomet Pond, Nantucket Harbor, and Sesachacha Pond (Curley 2002). Generally, in these four ponds water quality is monitored monthly for temperature, dissolved oxygen, salinity, Secchi disk depth, and water depth. Additionally, nutrients are collected during a subset of the months.

### **TOTAL MAXIMUM DAILY LOADS (TMDLs)**

As part of the Federal Clean Water Act States are required to develop TMDLs for lakes, rivers, and coastal waters not meeting the State's surface water quality standards as indicated by the State's 303(d) List of Waters. A TMDL is the greatest amount of a pollutant that a waterbody can accept and still meet standards. Further information on the 303(d) List and the TMDL program are available on the MA DEP website at: <http://www.dep.state.ma.us/dep/brp/wm/wmpubs.htm>.

MA DEP will need to produce TMDLs for various causes of impairment (e.g., nutrients and pathogens) for various waters in the Islands Watershed, but this work is not specifically scheduled yet.

### **OBJECTIVES**

This report summarizes information generated in the Islands Watershed through *Year 1* (information gathering in 1999) and *Year 2* (environmental monitoring in 2000) activities established in the "Five-Year Cycle" of the Massachusetts Watershed Initiative. Data collected by DWM in 2000 are provided in Appendices A and B of this report. Together with other sources of information (identified in each segment assessment) these data were used to assess the status of water quality conditions for selected salt ponds, coastal embayments, river and freshwater lakes in the Islands Watershed in accordance with EPA's and MA DEP's use assessment methods. Not all waters in the Islands Watershed are included in the MA DEP/EPA WBS database or this report.

The objectives of this water quality assessment report are to:

1. evaluate whether or not surface waters in the Islands Watershed, defined as segments in the WBS database, currently support their designated uses (i.e., meet surface water quality standards),
2. identify water withdrawals (habitat quality/water quantity) and/or major point (wastewater discharges) and nonpoint (land-use practices, storm water discharges, etc.) sources of pollution that may impair water quality conditions,
3. identify the presence of any non-native macrophytes in lakes,
4. identify waters (or segments) of concern that require additional data to fully assess water quality conditions,
5. recommend additional monitoring needs and/or remediation actions in order to better determine the level of impairment or to improve/restore water quality, and
6. provide information for the development of an Islands Watershed action plan.



## REPORT FORMAT

### **SALT PONDS/COASTAL EMBAYMENTS, FRESHWATER PONDS AND RIVERS**

Segments in this assessment report are presented within their respective island division: Nantucket, Martha's Vineyard, and Elizabeth (Figure 5). Each segment is formatted as follows:

#### **Segment identification**

Name, waterbody identification number (WBID), location, size, and classification.

Sources of information: Name, WBID (e.g. Segment MA97-01), location and size from coding system used by MA DEP to reference the segments in databases such as 305(b), 303(d) and ADB. Classification from the Massachusetts Surface Water Quality Standards (MA DEP 1996).

#### **Segment description**

Major land use estimates (the top three uses for the subwatershed/recharge area) and other descriptive information.

Sources of information: Major land use estimates from a geographic information system (GIS) analysis using the MassGIS land use coverage developed at a scale of 1:25,000 and based on aerial photographs taken in 1990 (UMass Amherst 1999). Descriptive information from USGS topographical maps and base geographic data from Massachusetts Geographic Information System (MassGIS), unless otherwise referenced.

Cranberry Bog Cultivation:

Source of information: For the purpose of this report, water use for cranberry cultivation within the recharge area has been estimated by using a volume of 10 acre-feet of water per acre of bog per year (1 acre-foot = 325,900 gallons). The acreage of cranberry bog within the recharge area has been estimated by using the MassGIS layer for Open Space – Cranberry Bogs. The figure of 10 acre-feet of water per acre of bog per year is based on a study conducted by the Cape Cod Cranberry Growers Association for the Massachusetts Water Management Act Program. It should be noted that this figure is used for "old style" bogs, those bogs that do not employ best management practices (BMPs) that conserve water. Most bogs constructed today, and many renovated older bogs, use BMPs, such as laser leveling, on-site reservoirs, tailwater recovery, etc., which result in reduced water usage (between 5 and 6 acre-feet of water per acre of bog per year). Therefore, the estimate of water usage within the subwatershed for cranberry cultivation is a conservative number (O'Shea 2002).

#### **Segment locator map**

Segment locations and subwatershed/recharge areas (gray shaded).

Sources of information: Segment locations from MassGIS data layers. Subwatershed/recharge areas from Martha's Vineyard Commission (MVC 2003) and Horsley, Witten, Hegemann, Inc. (HWH 1990 and Wood 1999).

#### **Water withdrawals and wastewater discharge permit information**

Water withdrawal and NPDES wastewater discharge summaries.

Sources of information: Water withdrawal from WMA Database (Levangie 2002) and open permit files located in Lakeville MA DEP office (MA DEP 2002c). NPDES from open permit files (MA DEP 2003) and personal communications (Burns 2003, Hogan 2003 and Mezzacappa 2003)

#### **Use assessment**

Aquatic Life, Fish Consumption, Shellfish Harvesting, Primary Contact Recreation, Secondary Contact Recreations, and Aesthetics.

Sources of information include: MA DEP DWM 2000 survey data (Appendix A) and eelgrass bed habitat data (Costello 2003a) were used to assess selected segments for *Aquatic Life* and *Aesthetics* uses. The MDPH Freshwater Fish Consumption Advisory Lists (MDPH 2001 and MDPH 2002a) were used to assess the *Fish Consumption Use*. The DMF shellfish status report was used to assess the *Shellfish Harvesting Use* (DFWELE 2000). Where other sources of information were used to assess designated uses, citations were included in the segment summary.

#### **Summary**

Use summary table (designated uses, status, causes and sources of impairment).



## ISLANDS WATERSHED – SEGMENT ASSESSMENTS

The following segments in the Islands Watershed are included in this report:

Segment Number	Segment Name	Segment Number	Segment Name
Nantucket:		Martha's Vineyard:	
MA97-01	Nantucket Harbor	MA97-05	Chilmark Pond
MA97-02	Sesachacha Pond	MA97-06	Menemsha Pond
MA97-03	Coskata Pond	MA97-07	Oak Bluffs Harbor
MA97-04	Great Point Pond	MA97-08	Cape Poge Bay
MA97-26	Polpis Harbor	MA97-09	Vineyard Haven Harbor
MA97-27	Madaket Harbor	MA97-10	Sengekontacket Pond
MA97-28	Hither Creek	MA97-11	Lagoon Pond
MA97-29	Long Pond	MA97-12	Lake Tashmoo
MA97028	Gibbs Pond	MA97-13	Oyster Pond
MA97055	Miacomet Pond	MA97-14	Mattakeset Bay
MA97097	Tom Nevers Pond	MA97-15	Edgartown Harbor
Elizabeth Islands:		MA97-16	Katama Bay
MA97-20	Westend Pond	MA97-17	Edgartown Great Pond
MA97-21	Cuttyhunk Pond	MA97-18	Tisbury Great Pond
		MA97-22	Mill Brook
		MA97-23	Paint Mill Brook
		MA97-24	Mill Brook
		MA97-25	Tiasquam River
		MA97085	Seths Pond

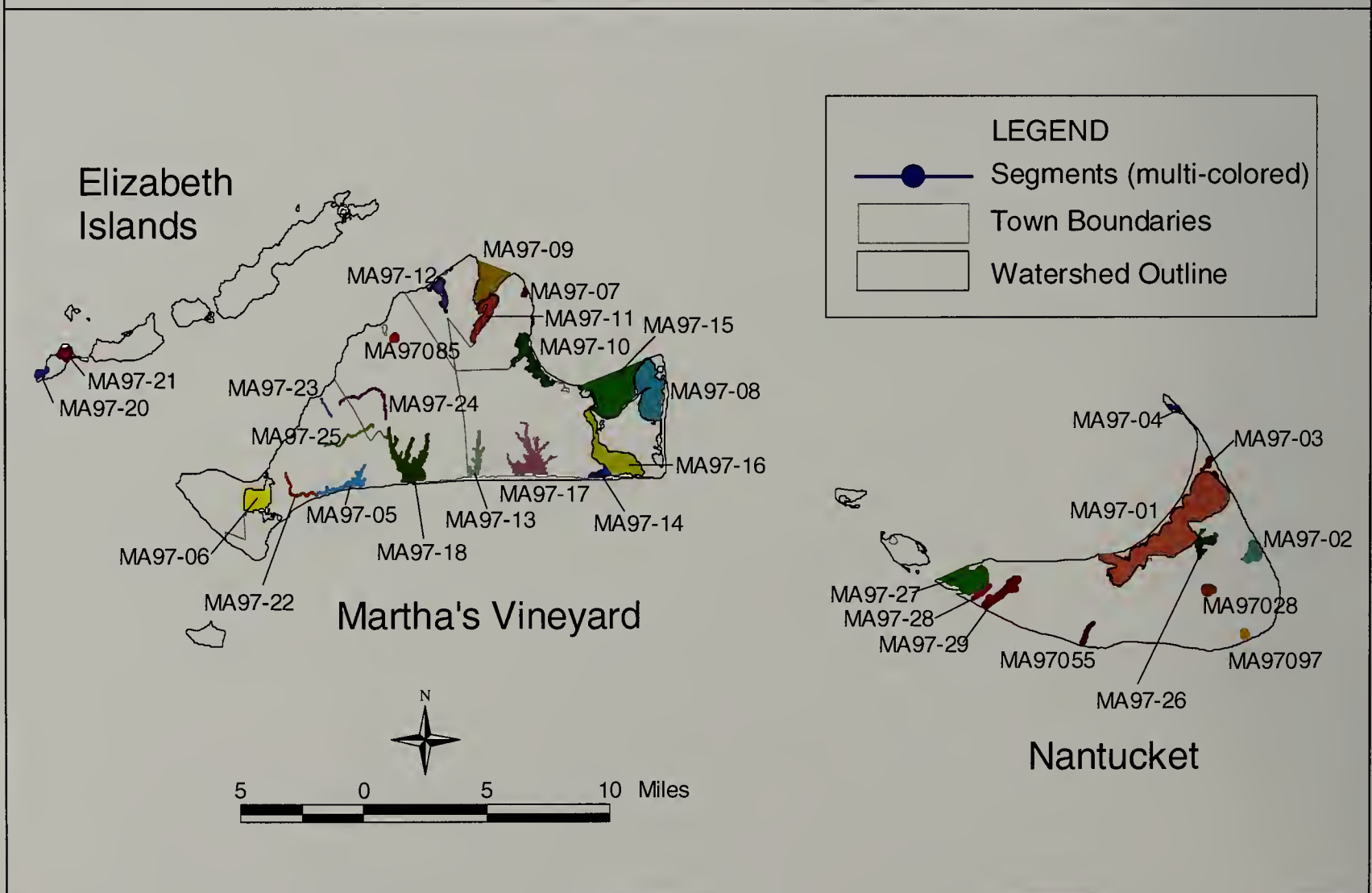


Figure 5. Assessed Segments in the Islands Watershed.

## NANTUCKET

### NANTUCKET HARBOR (SEGMENT MA97-01)

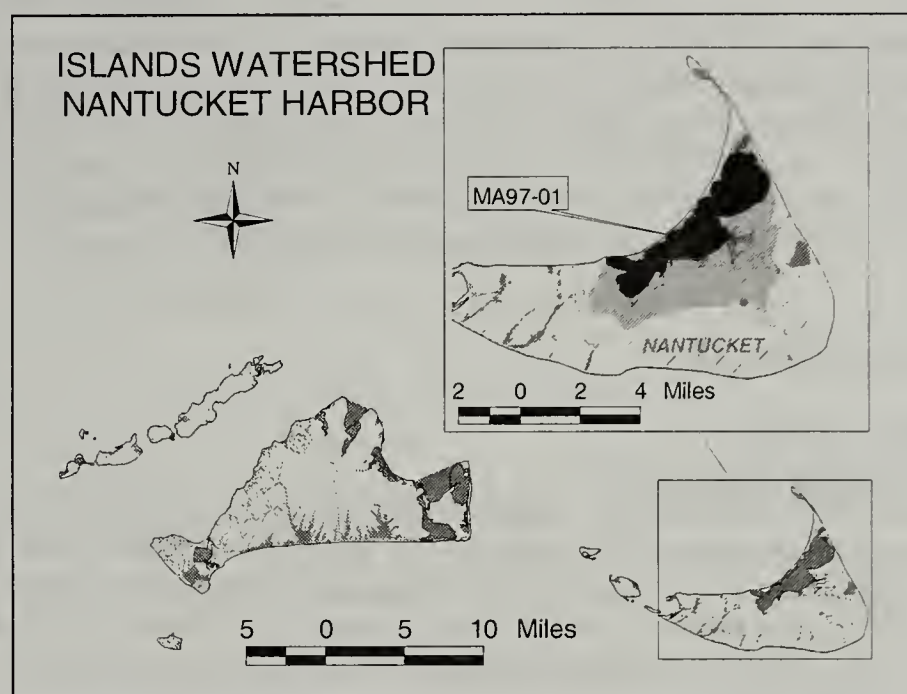
Location: From Head of the Harbor to an imaginary line drawn from Jetties Beach to Coatue Point (excluding Polpis Harbor and Coskata Pond), Nantucket.

Segment Area: 7.16 mi<sup>2</sup>

Classification: Class SA

Nantucket Harbor is on the Massachusetts 1998 303(d) List of Waters for nutrients, pathogens and noxious aquatic plants (Table 2).

Since 1993 the Town of Nantucket's Marine and Coastal Resource Department has been monitoring water quality in Hummock Pond, Miacomet Pond, Nantucket Harbor and Sesachacha Pond (Curley 2002). Generally, in these four waterbodies water quality is monitored monthly for temperature, dissolved oxygen, salinity, secchi disk depth, and water depth. Additionally nutrients are collected during a subset of the months.



Land-use estimates (top 3, excluding water) for the 12.1 mi<sup>2</sup> surface and ground water recharge area of Nantucket Harbor (map inset, gray shaded area):

Open Land	55%
Residential	19%
Forest	15%

There are 91.4 acres (0.14 mi<sup>2</sup>) of cranberry bog open space in the Nantucket Harbor recharge area (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area (inclusive but not limited to WMA registered growers) is 0.82 MGD (O'Shea 2002). In 2000, one grower, Nantucket Conservation Foundation, Inc., was registered under the Water Management Act to withdraw water for 271 acres of bog. However, all sources for Nantucket Conservation are not necessarily within the recharge area for this segment.

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX C, TABLE C2)

Facility	WMA Permit Number	WMA Registration Number	Source	Authorized Withdrawal (MGD)	Average Withdrawal (MGD)		
					2000	2001	2002
Wannacomet Water Company	9P42319701	42319703	4197000-01G 4197000-02G	0.61 Reg 0.62 Perm 1.23 Total <sup>1</sup>	1.22	1.26 <sup>2</sup>	1.41 <sup>3</sup>
Nantucket Conservation Foundation	NA	42319701	Winswept Bog Pond Winswept Bog Well	2.42 <sup>1</sup>	2.42	1.88	1.88

NA = not applicable; <sup>1</sup>indicates system-wide withdrawal, all sources are not necessarily within this segment;

<sup>2</sup>withdrawal did **not** exceed registration amount by more than 0.1 MGD (WMA threshold); <sup>3</sup>withdrawal exceeded registration amount by more than 0.1 MGD (WMA threshold)



## **NPDES WASTEWATER DISCHARGE SUMMARY**

Based on the available information, there are no NPDES permitted discharges on or in the recharge area for Nantucket Harbor. Additionally, Nantucket Harbor is a Federal "No Discharge Zone" -- no dumping of sewage, treated or untreated, is allowed (NMCRD 2002).

Nantucket Electric operated a power generation facility on Candle Street in Nantucket until 5 February 1998 (MA DEP 2003). This facility was issued a NPDES permit (MA0005118) for cooling water intake and discharge to Nantucket Harbor. The following is excerpted from a letter to MA DEP from Nantucket Electric dated 3 April 2002. "In December 1996, an undersea cable was completed to the mainland and on February 5, 1998 the Candle Street power station ceased operation. In the summer of 1998 the power plant was demolished and at that time all intake and discharge lines were filled with a flow-able fill cement mix. Nantucket Electric no longer requires a NPDES permit."

## **USE ASSESSMENT**

### ***Aquatic Life***

#### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Nantucket Harbor from historic 1951 black and white aerial photography (Costello 2003). MA DEP mapped Nantucket Harbor in 1994 from field verified 1993 aerial photography. Total coverage of Nantucket Harbor from the 1993/1994 surveys was almost 50% of the harbor. MA DEP field verified 1999 aerial photography identified marginal loss of eelgrass along the entire shoreline margins of the beds and in the central part of the harbor as compared to the 1993 survey.

Too little data are available; therefore, the *Aquatic Life Use* is not assessed for Nantucket Harbor.

### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that areas NT2.1, NT3.0 and NT5.0 (which contain 7.00 mi<sup>2</sup> of this segment) are approved and area NT2.2 (which includes 0.15mi<sup>2</sup> of this segment) is prohibited (DFWELE 2000).







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for 7.01 mi<sup>2</sup> and impaired for 0.15 mi<sup>2</sup> of this segment.

### ***Primary and Secondary Contact Recreation***

The Town of Nantucket Health Department monitors water quality weekly in the summer at two public beaches (Brant Point and Children's Beach) in Nantucket Harbor. No beach closures or postings occurred in 2001 or 2002 (Ray 2003).

Based on the public beach information (both beaches are located in prohibited shellfish harvesting areas) and the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support for this entire segment.

Nantucket Harbor (MA97-01) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Support 7.01 mi <sup>2</sup> Impaired 0.15 mi <sup>2</sup> Cause (known): fecal coliform bacteria Source: unknown
<i>Primary Contact</i>		Support
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Not Assessed

**RECOMMENDATIONS FOR NANTUCKET HARBOR (MA97-01):**

- Work with the Town of Nantucket's Marine and Coastal Resource Department to ensure that the water quality data they collect is quality assured. The development of a quality assurance project plan should be included as a part of their sampling program.
- Continue to monitor eelgrass bed habitat and water quality parameters necessary to assess the *Aquatic Life Use* status of Nantucket Harbor.
- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Develop a TMDL for Nantucket Harbor in accordance with the Massachusetts Estuaries Project.



## POLPIS HARBOR (SEGMENT MA97-26)

Location: Polpis Harbor and all adjacent coves to an imaginary line drawn from Quaise Point to the opposite shore, Nantucket

Segment Area: 0.30 mi<sup>2</sup>

Classification: Class SA

A recharge area for Polpis Harbor is not available; therefore land-use estimates cannot be determined.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges into Polpis Harbor.

### USE ASSESSMENT

#### ***Aquatic Life***

##### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Polpis Harbor from historic 1951 black and white aerial photography (Costello 2003). Field surveys conducted by MA DEP in 1998 and 2000 found no eelgrass in Polpis Harbor.

Because of the total loss of eelgrass bed habitat the *Aquatic Life Use* is assessed as impaired for Polpis Harbor. Suspected causes of this loss are tidal restriction and/or anthropogenic activities that result in reduced water clarity.

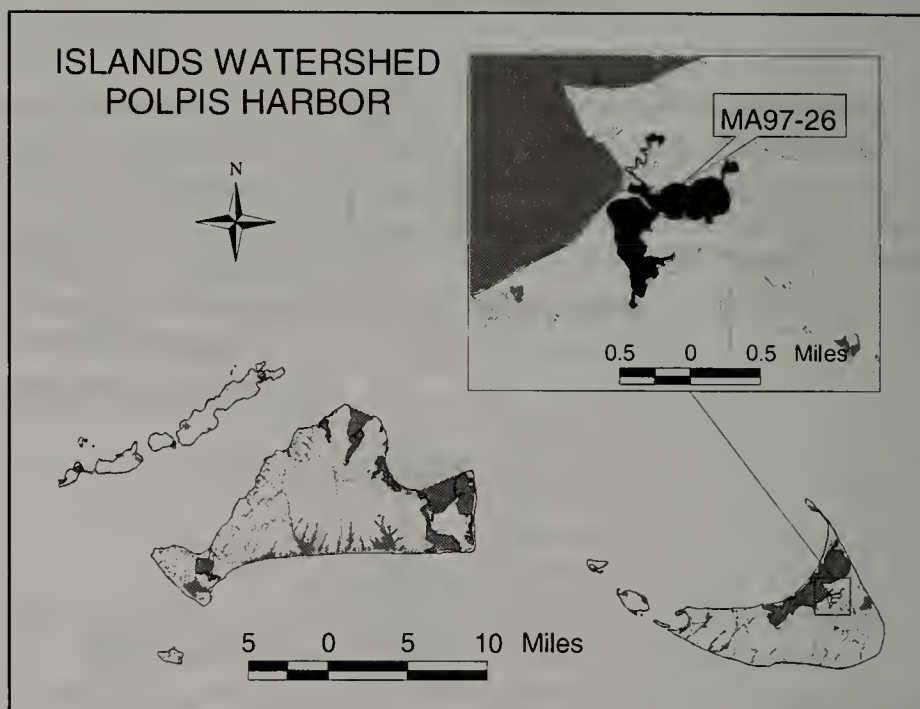
#### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that area NT4.0 (which contains 0.26 mi<sup>2</sup> of this segment) is approved and area NT4.1 (which contains 0.04mi<sup>2</sup> of this segment) is prohibited.







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for 0.26 mi<sup>2</sup> of this segment and impaired for 0.04 mi<sup>2</sup> of this segment.

#### ***Primary and Secondary Contact Recreation***

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support for 0.26 mi<sup>2</sup> of this segment and not assessed for 0.04 mi<sup>2</sup> of this segment.



Polpis Harbor (MA97-26) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Impaired Causes (known): estuarine bioassessments (loss of eelgrass bed habitat) Causes (suspected): tidal restriction and other anthropogenic substrate alterations Sources (suspected): changes in tidal circulation/fluctuation
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Support: 0.26 mi <sup>2</sup> Impaired: 0.04 mi <sup>2</sup> Cause (known): fecal coliform bacteria Sources (suspected): on-site treatment systems (septic systems) and wildlife other than waterfowl
<i>Primary Contact</i>		Support: 0.26 mi <sup>2</sup> Not Assessed: 0.04 mi <sup>2</sup>
<i>Secondary Contact</i>		Support: 0.26 mi <sup>2</sup> Not Assessed: 0.04 mi <sup>2</sup>
<i>Aesthetics</i>		Not Assessed

#### RECOMMENDATIONS FOR POLPIS HARBOR (MA97-26):

- Review conclusions in the *Southwest Polpis Harbor Bacteria Study Summer 2001* prepared by the Nantucket Land Council. Implement recommendations including: "future bacteria sampling to analyze the effectiveness of the Nantucket Board of Health's septic system inspection regulations, public outreach to improve existing educational projects, and complete an examination into the effectiveness of Title V systems in sandy soil" (Collier 2001).
- Continue to monitor eelgrass bed habitat and water quality parameters necessary to assess the *Aquatic Life Use* status of Polpis Harbor.
- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.



## COSKATA POND (SEGMENT MA97-03)

Location: Pond north of Nantucket Harbor to confluence with Nantucket Harbor, Nantucket.

Segment Area: 0.08 mi<sup>2</sup>

Classification: Class SA

A recharge area for Coskata Pond is not available; therefore, land-use estimates cannot be determined.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on Coskata Pond.

### USE ASSESSMENT

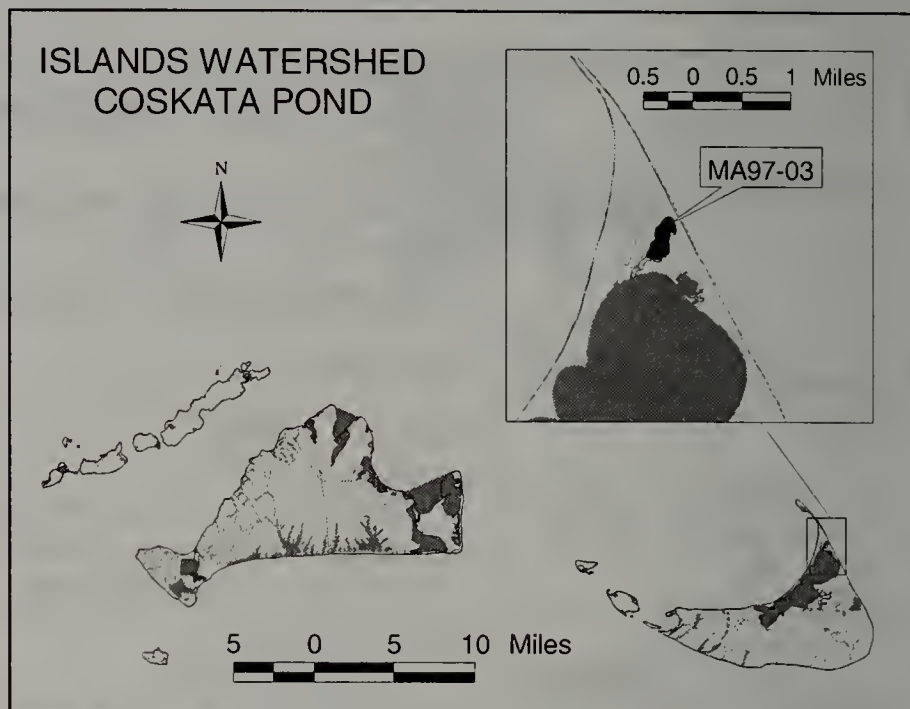
#### *Shellfish Harvesting*

The DMF Shellfish Status Report of July 2000 indicates that area NT6.0, which contains this entire segment, is approved (DFWELE 2000).







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support.

#### *Primary and Secondary Contact Recreation*

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support.



Coskata Pond (MA97-03) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
						
Status	Not Assessed	Not Assessed	Support	Support	Support	Not Assessed

## GREAT POINT POND (SEGMENT MA97-04)

Location: On Great Point to confluence with Nantucket Sound, Nantucket.

Segment Area: 0.06mi<sup>2</sup>

Classification: Class SA

A recharge area for Great Point Pond is not available; therefore, land-use estimates cannot be determined.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on Great Point Pond.

### USE ASSESSMENT

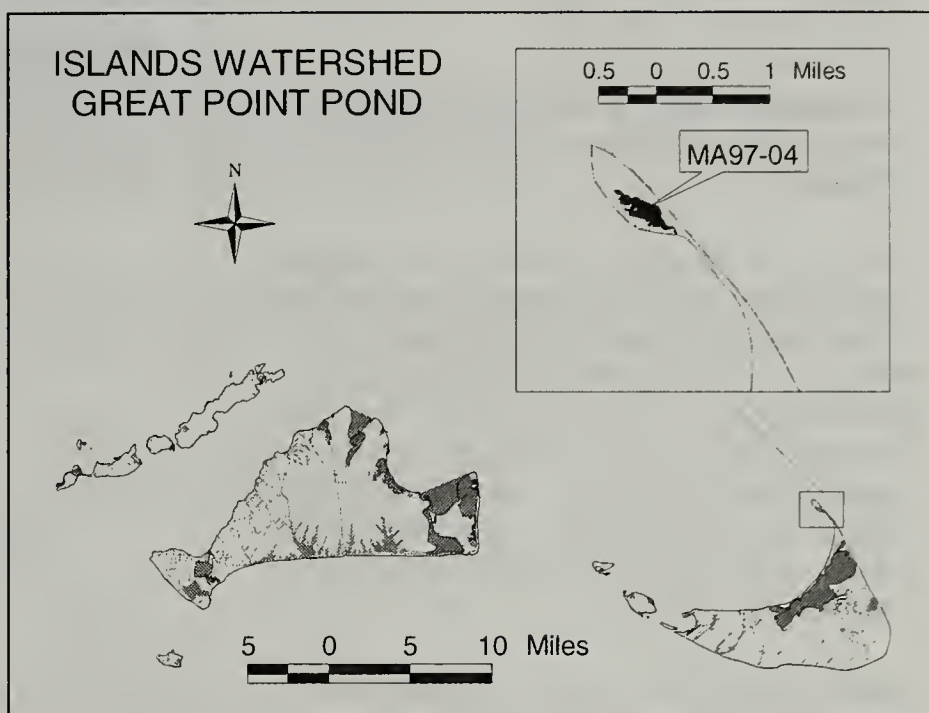
#### Shellfish Harvesting

The DMF Shellfish Status Report of July 2000 indicates that area NT1.0, which contains this entire segment, is approved (DFWELE 2000).







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support.

#### Primary and Secondary Contact Recreation

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support.



Great Point Pond (MA97-04) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
						
Status	Not Assessed	Not Assessed	Support	Support	Support	Not Assessed



## SESACHACHA POND (SEGMENT MA97-02)

Location: South of Quidnet Road and North of Polpis Road, Nantucket

Segment Area: 0.42 mi<sup>2</sup>

Classification: Class SA

Sesachacha Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

Since 1993 the Town of Nantucket's Marine and Coastal Resource Department has been monitoring water quality in Hummock Pond, Miacomet Pond, Nantucket Harbor and Sesachacha Pond (Curley 2002). Generally, in these four ponds water quality is monitored monthly for temperature, dissolved oxygen, salinity, Secchi disk depth, and water depth. Additionally nutrients are collected during a subset of the months.

Land-use estimates (top 3, excluding water) for the 2.3 mi<sup>2</sup> surface and ground water recharge area of Sesachacha Pond (map inset, gray shaded area):

Open Land	70%
Forest	5%
Residential	4%

There are 4.59 acres of cranberry bog open space in the Sesachacha Pond recharge area (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.04 MGD (not WMA registered or permitted users) (O'Shea 2002).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on or in the recharge area for Sesachacha Pond.

### USE ASSESSMENT

#### *Aquatic Life*

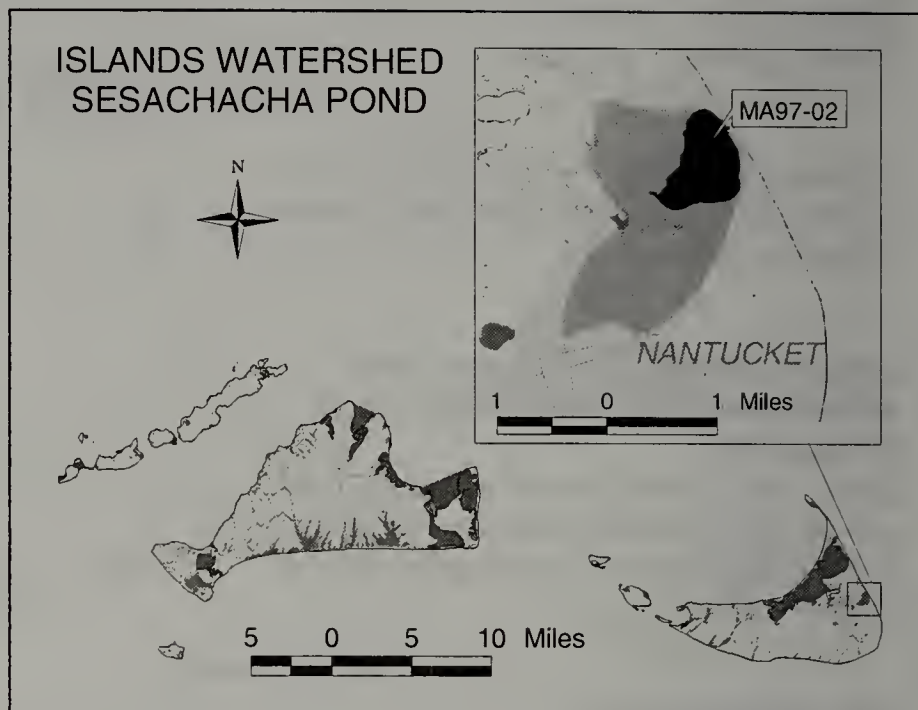
On 2 September 2000 a fish kill (Atlantic Silverside, Atlantic Herring and eelpout) was documented by the Nantucket Marine and Coastal Resource Department (Curley 2000). "A discrete phytoplankton sample revealed a high concentration of dinoflagellates."

Too little data are available; therefore, the *Aquatic Life Use* is not assessed for Sesachacha Pond, however, the pond is identified with an "Alert Status" because of the fish kill.

#### *Shellfish Harvesting*

The DMF Shellfish Status Report of July 2000 indicates that area NT9.0 (which includes this entire segment) is prohibited (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired.





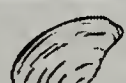
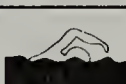

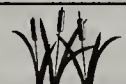
### **Primary and Secondary Contact Recreation**

The Town of Nantucket monitors bacteria weekly in the summer at the public beach on Sesachacha Pond. No beach closures have occurred in 2001 or 2002 (Ray personal communication, 17 April 2003).

While no quality assured data are currently available, it should be noted that the Nantucket Marine and Coastal Resource Department measures Secchi disk depth monthly at two stations on Sesachacha Pond. Secchi disk depth data collected annually since 1998 during the primary contact recreation season shows the majority of readings did not meet the Bathing Beach guidance of 4 feet, which is of concern and merits further investigation.

Based on the public beach closure information, the *Primary* and *Secondary Contact Recreation Uses* are assessed as support; however, the *Primary Contact Recreation Use* is identified with an "Alert Status" because of the Secchi disk depth violations.

Sesachacha Pond (MA97-02) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed*
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Impaired Cause (known): fecal coliform bacteria Source: unknown
<i>Primary Contact</i>		Support*
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Not Assessed

\* "Alert Status" issue identified; see details in the Use Assessment section.

### **RECOMMENDATIONS FOR SESACHACHA POND (MA97-02):**

- Work with the Town of Nantucket's Marine and Coastal Resource Department to ensure that the water quality data they collect are quality assured. The development of a quality assurance project plan should be included as a part of their sampling program.
- In order to ensure that future pond openings are successful, investigate past mechanical openings that "did not successfully exchange enough [pond water with ocean water] to dilute nutrient concentrations, maintain marine fisheries, or increase salinity (Curley 2001)". Implement flushing recommendations from the Town of Nantucket's Marine and Coastal Resource Department to improve water quality and prevent fish kills in Sesachacha Pond.
- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Develop a TMDL for Sesachacha Pond in accordance with the Massachusetts Estuaries Project.



## MADAKET HARBOR (SEGMENT MA97-27)

Location: The waters of Madaket Harbor, Nantucket to an imaginary line drawn northeast from the northern tip of Esther Island to Eel Point and to an imaginary line drawn southeast from the southern tip of Esther Island to the opposite land and to an imaginary line drawn easterly from Jackson Point to Little Neck.

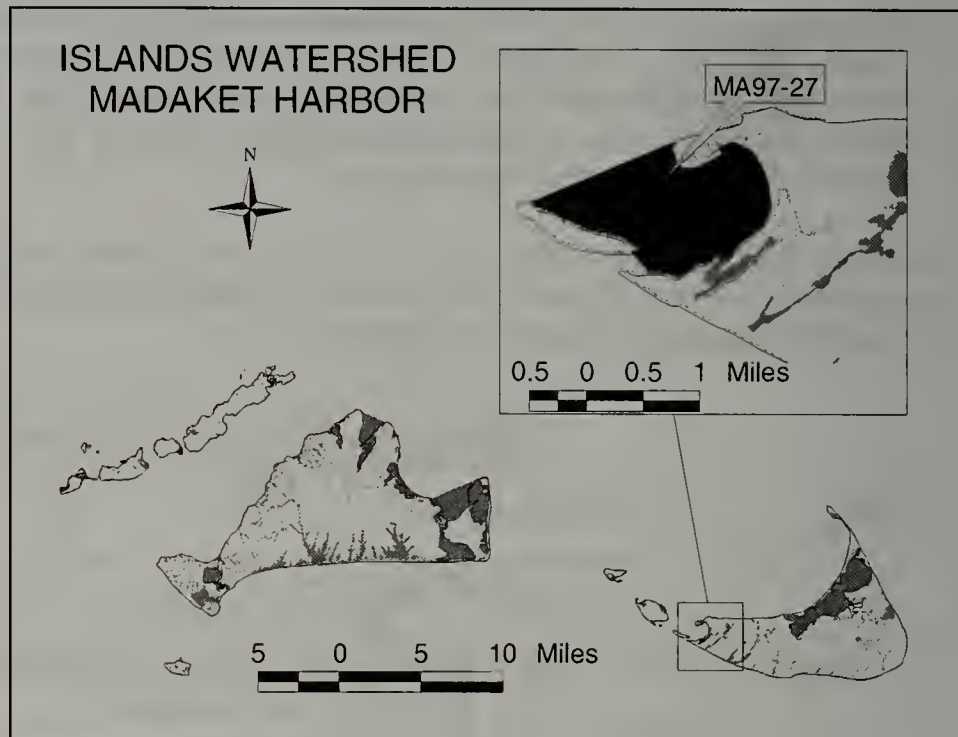
Segment Area: 1.4 mi<sup>2</sup>

Classification: Class SA

The recharge area for Madaket Harbor has not been identified; therefore, land use estimates are not available.

The Town of Nantucket manages a general access concrete boat ramp and parking for boat trailers at Jackson Point on Madaket Harbor (DFWELE 2002b).

Hydrographic and water quality data was collected by Northeast Aquatic Research (NEAR) in cooperation with Applied Science Associates from Madaket Harbor, Hither Creek and Long Pond as part of the Madaket Harbor Circulation Study (Ward and Swanson 2002).



## WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges in Madaket Harbor.

## USE ASSESSMENT

### *Aquatic Life*

#### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Madaket Harbor from historic 1951 black and white aerial photography (Costello 2003a). Field surveys conducted by MA DEP in 2000 revealed moderate to dense coverage of eelgrass over the entire harbor. Additionally, the condition of the eelgrass was identified as healthy with no drift algae and sparse epiphytes (Costello 2003b).

#### Chemistry

Water quality sampling was conducted by NEAR at two mid-depth stations in Madaket Harbor (MDH-out - offshore of Warren Landing and MDH-in - at the mouth of Hither Creek opposite Jackson Point) once per month from May to October 2001 (Ward and Swanson 2002). In-situ parameters included dissolved oxygen, pH, temperature and turbidity. Laboratory analyses were conducted for total nitrogen and total phosphorus. The maximum water depth observed at Station MDH-out was 4.2 feet and minimum depth was 2.0 feet. The maximum water depth observed at Station MDH-in was 8.2 feet and minimum depth was 5.5 feet.

#### *Dissolved Oxygen (DO)*

In-situ surface DO measurements by NEAR at MHD-out ranged from 6.0 to 9.8 mg/L. A DO profile in June 2001 showed a range of 6.7 to 7.8 mg/L. Surface DO measurements at MHD-in ranged from 6.06 to 9.98 mg/L. A DO profile in June 2001 showed a range of 7.78 to 8.85 mg/L. It should be noted, however, that these DO data do not represent worst-case (pre-dawn) conditions.

#### *Total Phosphorus*

NEAR total phosphorus concentrations from MHD-out ranged from 0.013 to 0.047 mg/L and from MHD-in ranged from 0.015 to 0.047 mg/L.

### *Nitrogen*

Ammonia was detected in two out of six surveys at NEAR's MHD-out station (0.064 and 0.025 mg/L). Ammonia was detected in four out of six surveys at the MHD-in station with detectable concentrations ranging from 0.022 to 0.071 mg/L.

Nitrate was not detected at either station on any of the sampling dates.

Organic nitrogen (reported as TKN) concentrations at MHD-out ranged from 0.400 to 1.55 mg/L and at MHD-in from 0.335 to 1.55 mg/L.

### *pH*

In-situ pH measurements by NEAR at MHD-out ranged from 7.8 to 8.4 SU and at MHD-in ranged from 7.2 to 8.3 SU.

### *Temperature*

In-situ surface temperature measurements by NEAR at MHD-out ranged from 15.4°C to 23.6°C. A temperature profile at this station in June 2001 showed a range of 21.4°C to 22°C. Surface temperature measurements at MHD-in ranged from 16.1°C to 23.6°C. A temperature profile at this station in June 2001 showed a range of 20.9°C to 22.8°C.

### *Turbidity*

In-situ turbidity measurements by NEAR at MHD-out ranged from 0.45 to 1.2 NTU and at MHD-in ranged from 0.6 to 1.3 NTU.

Based on the moderately dense and healthy eelgrass bed habitat data and water chemistry data the *Aquatic Life Use* is assessed as support.

### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that area NT11.3 (1.4 mi<sup>2</sup>) is conditionally approved and area NT11.2 (0.001 mi<sup>2</sup>) is prohibited (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired.

### ***Primary and Secondary Contact Recreation and Aesthetics***

Fecal coliform bacteria surface grabs were collected and Secchi disk depth measurements were made by NEAR in 2001 at two stations in Madaket Harbor as part of the Madaket Harbor Circulation Study (Ward and Swanson 2002). Fecal coliform bacteria counts were above detection limits in two out of six surveys at MHD-out (80 and 120 colonies/100mL) and at MHD-in (75 and 280 colonies/100mL). The geometric mean of both stations combined is 36 colonies/100mL.







"The water clarity of both sites, as measured by a Secchi disk, was not measurable because on each date the Secchi could be observed resting on the bottom" (Ward and Swanson 2002). Maximum water depth observed at Station MDH-out was 4.2 feet and minimum depth was 2.0 feet. Maximum water depth observed at Station MDH-in was 8.2 feet and minimum depth was 5.5 feet. MDPH's bathing beach guidance for transparency is  $\geq 4$  feet.

No objectionable aesthetic conditions (i.e., odors, scum, etc.) were noted by MA DEP in 2000 during the eelgrass bed habitat mapping survey (Costello 2003c).

Based on the bacteria and Secchi disk depth data, the *Primary and Secondary Contact Recreation Uses* are assessed as support. Based on the water clarity and observed aesthetic conditions, the *Aesthetics Use* is assessed as support.



Madaket Harbor (MA97-27) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Support
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Impaired Cause (known): fecal coliform bacteria Source (suspected): on-site treatment systems (septic systems)
<i>Primary Contact</i>		Support
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Support

**RECOMMENDATIONS FOR MADAKET HARBOR (MA97-27):**

- Conduct a full sanitary survey in order to identify sources of fecal coliform bacteria contamination to the shellfish beds.
- Continue to monitor eelgrass bed habitat and water quality parameters necessary to assess the *Aquatic Life Use* status of Madaket Harbor.
- Use the Madaket Harbor Circulation Model developed by Applied Science Associates, Inc. to “develop long term monitoring plans and management strategies to assist in improving the health of the [Madaket Harbor/Long Pond] ecosystem and re-opening the fisheries (Ward and Swanson 2002).
- Develop a TMDL for Madaket Harbor in accordance with the Massachusetts Estuaries Project.

## HITHER CREEK (SEGMENT MA97-28)

Location: From the outlet of Madaket Ditch to an imaginary line drawn easterly from Jackson Point to Little Neck, Nantucket.

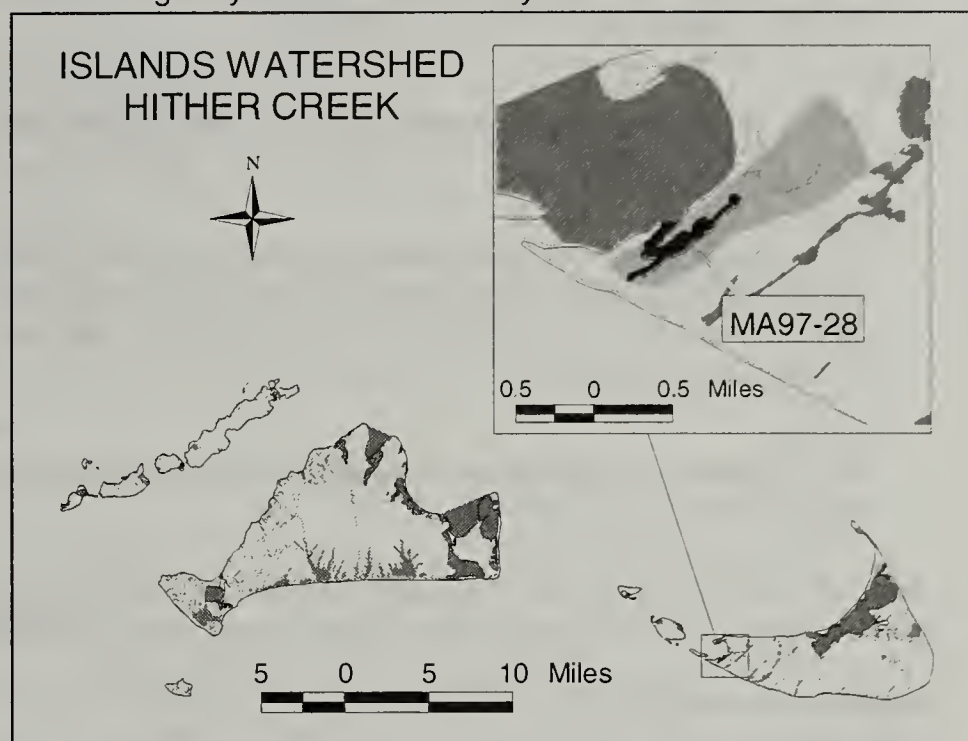
Segment Area: 0.07 mi<sup>2</sup>

Classification: Class SA

Land-use estimates (top 3, excluding water) for the 0.58 mi<sup>2</sup> surface and ground water recharge area of Hither Creek (map inset, gray shaded area):

Residential	37%
Open Land	29%
Wetlands	20%

A concrete pad fisherman's access for smaller boats and parking for boat trailers (managed by the Town of Nantucket) is located on Hither Creek at F Street, Nantucket (DFWELE 2002b).



Hydrographic and water quality data was collected by Northeast Aquatic Research (NEAR) in cooperation with Applied Science Associates from Madaket Harbor, Hither Creek and Long Pond as part of the Madaket Harbor Circulation Study (Ward and Swanson 2002).

## WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals from or NPDES permitted discharges to Hither Creek.

## USE ASSESSMENT

### Aquatic Life

#### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Hither Creek from historic 1951 black and white aerial photography (Costello 2003). Field surveys conducted by MA DEP in 2000 revealed sparse beds of eelgrass along some of the shoreline of Hither Creek.

#### Chemistry

Water quality sampling was conducted by NEAR at one station in Hither Creek, approximately 2000 feet north of the opening to Madaket Harbor, where both a top (HC Top) and bottom (HC Bottom) sample were taken once per month from May to October 2001 (Ward and Swanson 2002). In-situ parameters included dissolved oxygen, pH, temperature and turbidity. Laboratory analyses were conducted for total nitrogen and total phosphorus. Water at the sampling station had a maximum depth of 9.0 feet and a minimum depth of 6.0 feet.

#### *Dissolved Oxygen (DO)*

In-situ surface DO measurements by NEAR in Hither Creek ranged from 6.13 to 8.15 mg/L. DO profiles ranged from 7.11 to 7.97 in May, from 6.05 to 8.15 mg/L in June, from 6.13 to 7.29 in July, from 4.56 to 6.72 in August, from 0.22 to 7.07 in September and from 6.84 to 7.68 in October. It should be noted, however, that these DO data do not represent worst-case (pre-dawn) conditions.

#### *Nitrogen*

Ammonia concentrations at NEAR's HC Top station ranged from 0.028 to 0.175 mg/L and at HC Bottom from not detected to 0.145 mg/L.

Nitrate was not detected in Hither Creek on any of the sampling dates.

Organic nitrogen (reported as TKN) concentrations at HC Top ranged from 0.440 to 1.4 mg/L with 4 of 6 samples greater than 1.0 mg/L. TKN concentrations at HC Bottom ranged from 0.470 to 2.22 mg/L with 3 of 6 samples greater than 1.0 mg/L.



#### *Total Phosphorus*

NEAR total phosphorus concentrations from HC Top ranged from 0.026 to 0.154 mg/L and from HC Bottom ranged from 0.045 to 0.191 mg/L.

#### *pH*

In-situ pH measurements by NEAR at HC Top ranged from 7.6 to 7.9 SU and at HC Bottom ranged from 7.7 to 8.1 SU.

#### *Temperature*

In-situ surface temperature measurements by NEAR in Hither Creek ranged from 16.8 to 24.1°C. Temperature profiles ranged from 15.9 to 16.8°C (May 2001), 21.6 to 23.1°C (June 2001), 23.6 to 23.9°C (July 2001), 24.0 to 24.3°C (August 2001), 20.2 to 20.7°C (September 2001), and 16.0 to 17.2°C (October 2001).

#### *Turbidity*

In-situ turbidity measurements by NEAR at HC Top ranged from 1.4 to 3.0 NTU and at HC Bottom ranged from 1.4 to 26 NTU.

Based on the bottom oxygen depletion and best professional judgment that nitrogen concentrations are high, the *Aquatic Life Use* for Hither Creek is assessed as impaired.

#### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that area NT11.1 (which includes this entire segment) is prohibited (DFWELE 2000). However, the prohibited status is a DMF policy closure due to the presence of a commercial shipyard in the area (Ward and Swanson 2002).

Based on the DMF shellfish growing area status (policy closure), the *Shellfish Harvesting Use* is not assessed.







#### ***Primary and Secondary Contact Recreation***

Fecal coliform bacteria samples were collected and Secchi disk depth measurements were made by NEAR once per month, from May to October 2001, at the water quality station in Hither Creek as part of the Madaket Harbor Circulation Study (Ward and Swanson 2002). Three of the bacteria samples were <20 colonies/100mL and detectable counts were 60, 120 and 1375 colonies/100mL. The geometric mean of this station is 66 colonies/100mL with only one of the samples exceeding 400 colonies/100mL (the bathing beach guidance for marine waters). Two additional fecal coliform samples were collected in September and October 2001 at a sampling station at the southern end of Hither Creek. Counts were 450 and 2040 colonies/100mL and collected with significant rainfall one or two days prior to sampling indicating that elevated counts may be due to storm water.

Secchi disk depth measurements ranged from a minimum of 5.2 feet in July to a maximum of 7.4 feet in October (Ward and Swanson 2002).

Based on the bacteria data and Secchi disk depth measurements, the *Primary and Secondary Contact Recreation Uses* are assessed as support. However, the *Primary Contact Recreation Use* is identified with an "Alert Status" because of elevated bacteria counts that appear to be associated with wet weather.

Hither Creek (MA97-28) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Impaired Cause (known): total nitrogen and dissolved oxygen Source: unknown
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Not Assessed
<i>Primary Contact</i>		Support*
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Not Assessed

\* "Alert Status" issue identified; see details in the Use Assessment section.

**RECOMMENDATIONS FOR HITHER CREEK (MA97-28):**

- Continue to monitor bacteria levels and water clarity in order to assess the contact recreation uses of Hither Creek. Include dry and wet weather sampling to identify potential sources of bacteria contamination.
- Continue to monitor eelgrass bed habitat and water quality parameters necessary to assess the *Aquatic Life Use* status of Hither Creek.
- Develop a TMDL for Hither Creek in accordance with the Massachusetts Estuaries Project.



## LONG POND (SEGMENT MA97-29)

Location: From Madaket Road south to Columbus Avenue, including White Goose Cove, Nantucket.

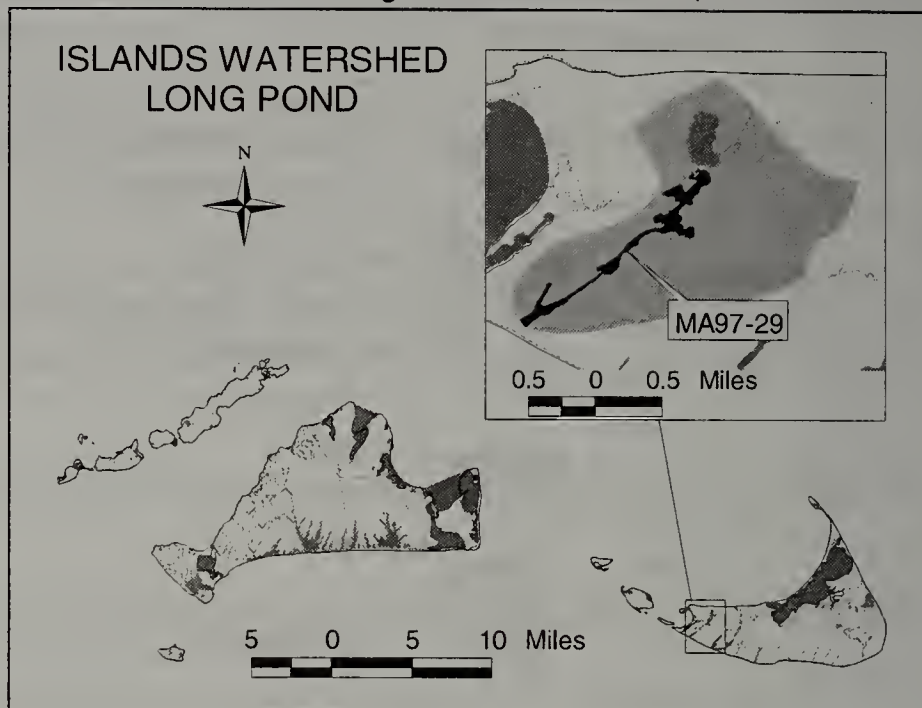
Segment Area: 0.12 mi<sup>2</sup>

Classification: Class SA

Land-use estimates (top 3, excluding water) for the 2.5 mi<sup>2</sup> surface and ground water recharge area of Long Pond (map inset, gray shaded area):

Open Land	69%
Residential	10%
Forest	5%

Hydrographic and water quality data was collected by Northeast Aquatic Research (NEAR) in cooperation with Applied Science Associates from Madaket Harbor, Hither Creek and Long Pond as part of the Madaket Harbor Circulation Study (Ward and Swanson 2002).



## WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on or in the recharge area for Long Pond.

## USE ASSESSMENT

### ***Aquatic Life***

#### Chemistry

Water quality sampling was conducted by NEAR at three stations in Long Pond (northern, central and southern sites). Samples were taken mid-depth, once per month from May to October 2001 (Ward and Swanson 2002). In-situ parameters included dissolved oxygen, pH, temperature and turbidity. Laboratory analyses were conducted for total nitrogen and total phosphorus. Water depths in Long Pond ranged between 3 and 4.7 feet.

#### *Dissolved Oxygen (DO)*

##### *Long Pond North:*

In-situ surface DO measurements by NEAR at Long Pond North ranged from 7.93 to 9.64 mg/L. A DO profile in June 2001 showed a range of 4.45 to 7.93 mg/L and in August 2001 DO ranged from 3.39 to 9.30 mg/L. It should be noted, however, that these DO data do not represent worst-case (pre-dawn) conditions.

##### *Long Pond Center:*

In-situ surface DO measurements by NEAR at Long Pond Center ranged from 7.71 to 14.48 mg/L. A DO profile in June 2001 showed a range of 7.71 to 8.67 mg/L and in August 2001 DO ranged from 0 to 13.59 mg/L. It should be noted, however, that these DO data do not represent worst-case (pre-dawn) conditions.

##### *Long Pond South:*

In-situ surface DO measurements by NEAR at Long Pond South ranged from 7.65 to 12.56 mg/L. A DO profile in June 2001 showed a range of 7 to 9.23 mg/L and in August 2001 DO ranged from 0.07 to 10.29 mg/L. It should be noted, however, that these DO data do not represent worst-case (pre-dawn) conditions.

#### *Total Phosphorus*

NEAR total phosphorus concentrations at Long Pond North ranged from 0.027 to 0.195 mg/L, at Long Pond Center ranged from 0.040 to 0.442 mg/L and at Long Pond South ranged from 0.024 to 0.246 mg/L.

### *Nitrogen*

NEAR ammonia concentrations at Long Pond North ranged from 0.045 to 0.273 mg/L, at Long Pond Center ranged from 0.051 to 1.200 mg/L and at Long Pond South ranged from 0.049 to 0.800 mg/L.

Nitrate was not detected at any of the stations on any of the sampling dates.

Organic nitrogen (reported as TKN) concentrations at Long Pond North ranged from 0.536 to 2.02 mg/L, at Long Pond Center ranged from 0.585 to 2.330 mg/L and at Long Pond South ranged from 0.715 to 2.330 mg/L.

### *pH*

In-situ pH measurements by NEAR at Long Pond North ranged from 7.2 to 7.9 SU, at Long Pond Center ranged from 7.1 to 7.9 SU and at Long Pond South ranged from 6.9 to 8.0 SU.

### *Temperature*

#### *Long Pond North:*

In-situ surface temperature measurements by NEAR at Long Pond North ranged from 18.5 to 26.3°C. Temperature profiles showed changes from surface to bottom of less than 1°C.

#### *Long Pond Center:*

In-situ surface temperature measurements by NEAR at Long Pond Center ranged from 18.5 to 26.3°C. Temperature profiles showed changes from surface to bottom of less than 2°C.

#### *Long Pond South:*

In-situ surface temperature measurements by NEAR at Long Pond South ranged from 18.1 to 25.5°C. Temperature profiles showed changes from surface to bottom of less than 1°C with the exception of a 2.7°C change in June 2001.

### *Turbidity*

In-situ turbidity measurements by NEAR at Long Pond North ranged from 3.8 to 8.4 NTU, at Long Pond Center ranged from 2.0 to 8.5 NTU and at Long Pond South ranged from 3.3 to 16 NTU.

Based on the oxygen profiles ranging from supersaturated to anoxic and best professional judgment that nitrogen concentrations are high, the *Aquatic Life Use* for Long Pond is assessed as impaired.

### ***Primary and Secondary Contact Recreation***






Fecal coliform bacteria samples were collected and Secchi disk depth measurements were taken by NEAR once per month, from May to October 2001, at three water quality stations in Long Pond (Long Pond North, Long Pond Center and Long Pond South) and from one station at the inlet to Long Pond as part of the Madaket Harbor Circulation Study (Ward and Swanson 2002). Fecal coliform bacteria counts at Long Pond North ranged from <20 to 325 colonies/100mL, at Long Pond Center ranged from <20 to 480 colonies/100mL and at Long Pond South ranged from <20 to 2750 colonies/100mL. The geometric mean of the three stations combined is 111 colonies/100mL with only two out of 18 samples (11%) exceeding 400 colonies/100mL (the bathing beach guidance for marine waters). Counts at the inlet to Long Pond ranged from <20 to 760 colonies/100mL with a geometric mean of 122 colonies/100mL and 2 out of 6 samples exceeding 400 colonies/100mL. Three additional fecal coliform samples were collected in August, September and October 2001 at a sampling station in White Goose Cove on Long Pond. Counts were 2120, 700 and 50 colonies/100mL, respectively (geometric mean = 420 colonies/100mL) and were collected with significant rainfall on the day of sampling (August) or one or two days prior to sampling indicating that elevated counts may be due to storm water.

"The water clarity in Long Pond [as measured with a Secchi disk] was between 2 and 2.7 feet except in June water clarity was between 3 and 4.8 feet and in July clarity was between 1 and 1.5 feet (Ward and Swanson April 2002)."

Based on the high fecal coliform bacteria densities and low Secchi disk depth measurements, the *Primary Contact Recreation Use* is assessed as impaired and the *Secondary Contact Recreation Use* is assessed as support.



Long Pond (MA97-29) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Impaired Cause (known): total nitrogen, dissolved oxygen, and dissolved oxygen saturation Source: unknown
<i>Fish Consumption</i>		Not Assessed
<i>Primary Contact</i>		Impaired
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Not Assessed

**RECOMMENDATIONS FOR LONG POND (MA97-29):**

- Develop a TMDL for Long Pond in accordance with the Massachusetts Estuaries Project.
- Continue to monitor bacteria levels and water clarity in order to assess the contact recreation uses of Long Pond. Include dry and wet weather sampling to identify potential sources of bacteria contamination.

## GIBBS POND (SEGMENT MA97028)

Location: Nantucket  
Segment Size: 34 acres  
Classification: Class B

A recharge area for Gibbs Pond is not available; therefore, land-use estimates cannot be determined.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on Gibbs Pond.

### USE ASSESSMENT

#### *Aquatic Life*

##### Chemistry

On 25 September 2000 DWM performed in-situ water quality measurements of Gibbs Pond (Mattson 2003). Hydrolab® profile results are below. The depth of Gibbs Pond at this station was 5.8 meters.

Time (24 hr)	Depth (m)	Temperature (°C)	pH (SU)	Specific Conductivity at 25°C (µS/cm)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/L)	DO Saturation (percent)
14:06	0.5	19.8	6.4	109	69.8	8.6	93%
14:13	1.4	19.7	6.4	109	69.8	8.5	91%
14:19	2.5	19.4	6.3	109	69.7	8.1	86%
14:25	3.5	19.3	6.3	109	69.7	8.1	86%
14:32	4.5	19.3	6.3	109	69.7	7.9	84%
14:39	5.3	19.2	6.2	109	69.8	7.6	81%

Water chemistry results from DWM's lake survey are below. The depth of Gibbs Pond at this station was 5.8 meters.

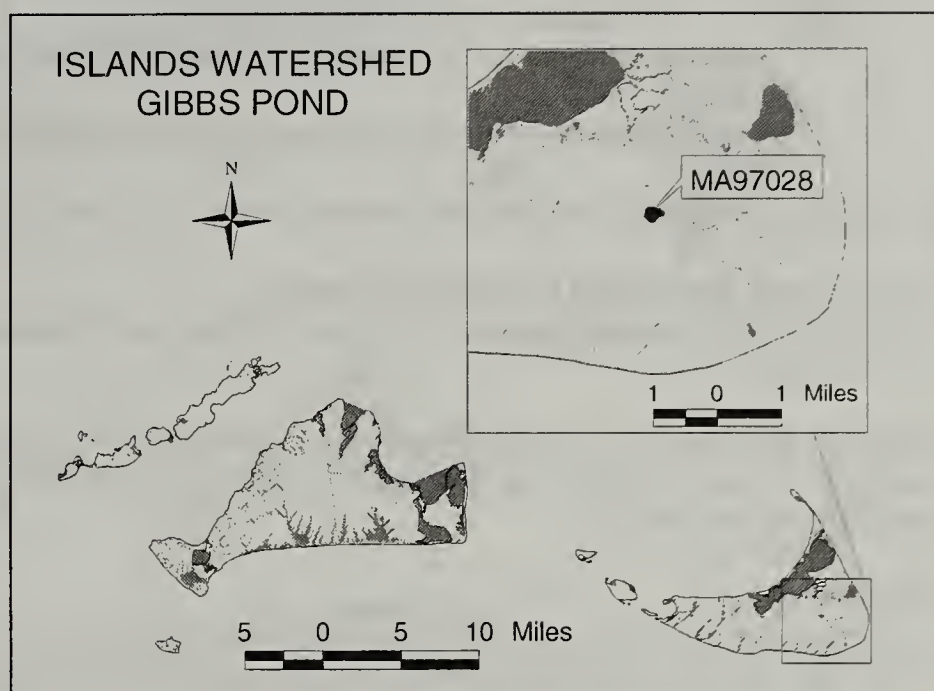
Time	Sample ID	Sample Depth (m)	Alkalinity (mg/L)	Total Phosphorus (mg/L)	Apparent Color (PCU)
*	LB-0865	0.5	4	1.2	130**
*	LB-0866	0.5	4	1.2	65**
*	LB-0867 Duplicate	0.5	4	1.2	90**
*	LB-0868 Blank	0.5	<2	<0.005	<15
*	LB-0869	5.3	4	1.2	120**

\*Censored data. \*\*Qualified data: precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP.

##### Biology

On 25 September 2000 DWM collected an integrated chlorophyll *a* sample from Gibbs Pond (Mattson 2003). The chlorophyll *a* concentration (qualified because of a sample holding time violation) was 8.1mg/m<sup>3</sup>.

Too little water quality data are available to assess the *Aquatic Life Use*, therefore, it is not assessed. However, it is identified with an "Alert Status" because of the elevated total phosphorus concentrations.





### ***Fish Consumption***

In October 1995 fish toxics monitoring was conducted by DWM in Gibbs Pond. These data can be found in Appendix B, Table B1. Because of elevated mercury concentrations, MDPH issued a fish consumption advisory recommending the following:

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Gibbs Pond."
2. "The general public should limit consumption of all fish from Gibbs Pond to two meals per month."

Due to the site-specific fish consumption advisory, the *Fish Consumption Use* is assessed as impaired.

### ***Primary and Secondary Contact Recreation***

At 14:00 on 25 September 2000 the Secchi disk depth reported by DWM was 1.5 meters at the deep hole station.






Although the Secchi disk depth meets the bathing beach guidance of  $\geq 1.2$  meters, too few readings are available to assess the recreational uses. Therefore, the *Primary* and *Secondary Contact Recreation Uses* are not assessed.

### ***Aesthetics***

No algal bloom, objectionable deposits, odors or floating scum were noted by DWM in 2000 during the lake survey. The orange-brown watercolor appears to be natural color from the bordering wetland.

Too little information is available to assess the *Aesthetics Use*, therefore, it is not assessed.

Gibbs Pond (MA97028) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed*
<i>Fish Consumption</i>		Impaired Cause (known): mercury Source: unknown
<i>Primary Contact</i>		Not Assessed
<i>Secondary Contact</i>		Not Assessed
<i>Aesthetics</i>		Not Assessed

\* "Alert Status" issue identified; see details in the Use Assessment section.

### **RECOMMENDATIONS FOR GIBBS POND (MA97028):**

- Continue to monitor water quality parameters necessary to assess the Aquatic Life Use of Gibbs Pond.
- Continue to monitor bacteria levels and water clarity in order to assess the Contact Recreation uses of Gibbs Pond.

## MIACOMET POND (SEGMENT MA97055)

Location: Nantucket  
Segment Size: 34 acres  
Classification: Class B

Since 1993 the Town of Nantucket's Marine and Coastal Resource Department has been monitoring water quality in Hummock Pond, Miacomet Pond, Nantucket Harbor and Sesachacha Pond (Curley 2002). Generally, in these four ponds water quality is monitored monthly for temperature, dissolved oxygen, salinity, Secchi disk depth, and water depth. Additionally, nutrients are collected during a subset of the months.

Land-use estimates (top 3, excluding water) for the surface and ground water recharge area (1425 acres) of Miacomet Pond (map inset, gray shaded area):

Residential	50%
Open Land	27%
Forest	17%

A nutrient loading model for Miacomet Pond was developed by Applied Science Associates, Inc. as part of an MWI project (Project # 2001-10/MWI see Appendix D).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX C, TABLE C2)

Facility	WMA Permit Number	Source	Authorized Withdrawal (MGD)	Average Withdrawal (MGD)		
				2000	2001	2002
Miacomet Golf Club	9P44231970	GW-1	0.12	not available	not available	0.06

### NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no NPDES permitted discharges to Miacomet Pond.

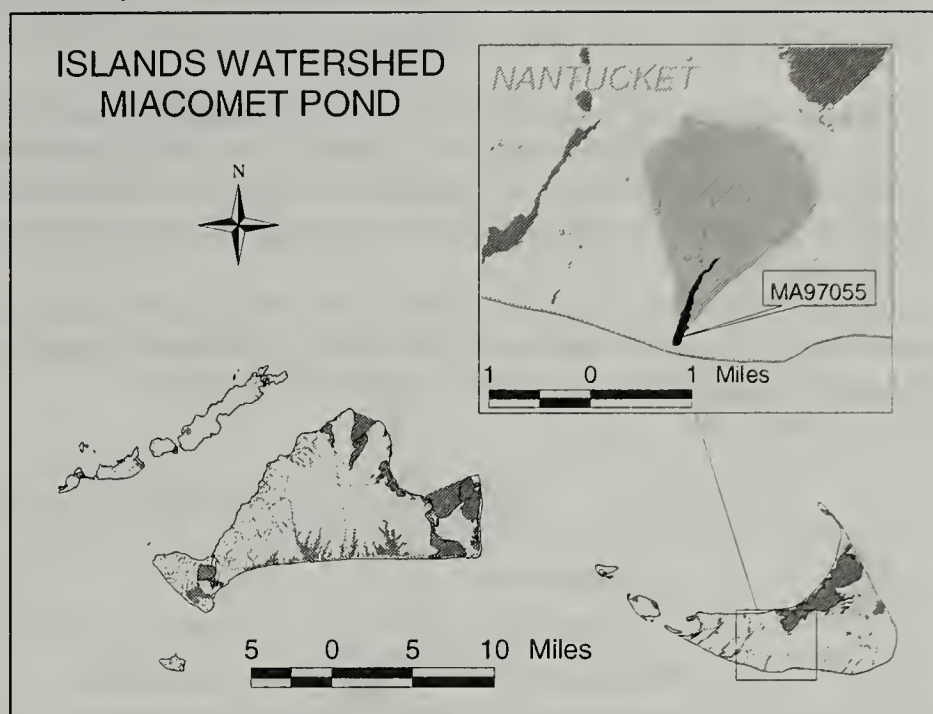
### USE ASSESSMENT

#### *Fish Consumption*

In October 1995 fish toxics monitoring was conducted by DWM in Miacomet Pond. These data can be found in Appendix B, Table B1. Because of elevated mercury concentrations MDPH issued a fish consumption advisory recommending the following:

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Miacomet Pond."
2. "The general public should not consume any white perch caught from Miacomet Pond."
3. "The general public should limit consumption of non-affected fish species from Miacomet Pond to two meals per month."

Due to the site-specific fish consumption advisory, the *Fish Consumption Use* is assessed as impaired.










### **Primary and Secondary Contact Recreation**

The Town of Nantucket Health Department monitors bacteria weekly in the summer at the beach on Miacomet Pond. No beach postings or closures have occurred in 2001 or 2002 (Ray 2003).

While no quality assured data are currently available, it should be noted that the Marine and Coastal Resource Department in the Town of Nantucket measures Secchi disk depth monthly at two to four stations on Miacomet Pond. Data collected since 1999 shows occasional violations of the 4' Bathing Beach guidance for transparency during the primary contact recreation season.

Based on the public beach information the *Primary and Secondary Contact Recreation Uses* are assessed as support. However, the *Primary Contact Recreation Use* is identified with an "Alert Status" because of the occasional Secchi disk depth violations.

Miacomet Pond (MA97055) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed
<i>Fish Consumption</i>		Impaired Cause (known): mercury Source: unknown
<i>Primary Contact</i>		Support*
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Not Assessed

\* "Alert Status" issue identified; see details in the Use Assessment section.

### **RECOMMENDATIONS FOR MIACOMET POND (MA97055):**

- Work with the Town of Nantucket's Marine and Coastal Resource Department to ensure that the water quality data they collect is quality assured. The development of a quality assurance project plan should be included as a part of their sampling program.
- Develop flood and water quality management strategies for Miacomet Pond. Hydrologic and water quality studies should then be conducted to verify the Miacomet Pond Nutrient Loading model and establish the relative magnitude of sources identified by the model.

## TOM NEVERS POND (SEGMENT MA97097)

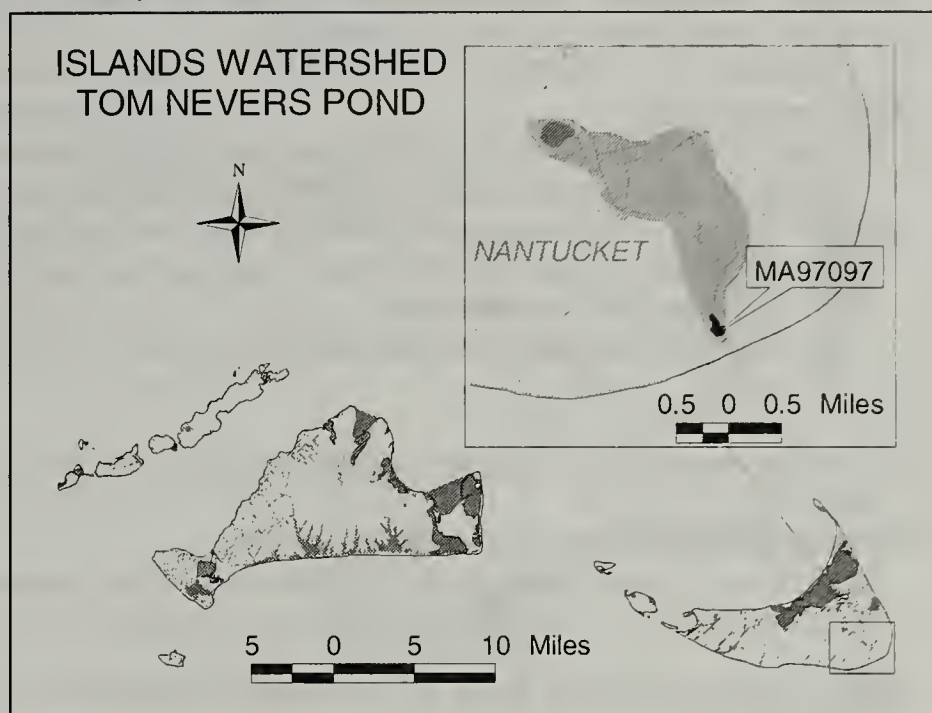
Location: Nantucket  
Segment Size: 13 acres  
Classification: Class B

Land-use estimates (top 3, excluding water) for the surface and ground water recharge area (91.4 acres) of Tom Nevers Pond (map inset, gray shaded area):

Open Land	76%
Wetlands	8%
Forest	4%

There are 277.4 acres of cranberry bog open space in the Tom Nevers Pond recharge area (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area (inclusive but not limited to WMA

registered growers) is 2.48 MGD (O'Shea 2002). In 2000, one grower, Nantucket Conservation Foundation, Inc., was registered under the Water Management Act to withdraw water for 271 acres of bog. However, all sources for Nantucket Conservation Foundation are not necessarily within the recharge area for this segment.



### WMA WATER WITHDRAWAL SUMMARY (APPENDIX C, TABLE C2)

Facility	WMA Permit Number	WMA Registration Number	Source	Authorized Withdrawal (MGD)	Average Withdrawal (MGD)		
					2000	2001	2002
Nantucket Conservation Foundation	NA	42319701	Gibbs Pond Milestone Road Bog Well	2.42 <sup>1</sup>	2.42	1.88	1.88
Nantucket Golf Club	9P242319702	NA	NGC Well #1	0.19	0.08	0.16	0.13

NA = not applicable; <sup>1</sup> indicates system-wide withdrawal, all sources are not necessarily within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no NPDES permitted discharges on or in the recharge area for Tom Nevers Pond.

### USE ASSESSMENT

#### ***Aquatic Life***

##### Chemistry

In-situ Hydrolab® readings were taken by DWM on 25 September 2000 at 11:35 am at the 1 meter deep hole in Tom Nevers Pond (Mattson 2003). At 0.6 meters the temperature was 19.1°C, pH was 5.6 SU, specific conductivity was 94.7 µS/cm, total dissolved solids was 60.6 mg/L, dissolved oxygen was 8.5 mg/L and the percent saturation of dissolved oxygen was 90%.

Water chemistry grab samples were collected at a depth of 0.5 meters at the deep hole. Total alkalinity was 2 mg/L, total phosphorus was 1.1 mg/L, and apparent color was 260 pcu

##### Biology

On 25 September 2000 DWM collected an integrated chlorophyll  $\alpha$  sample from Tom Nevers Pond (Mattson 2003). The chlorophyll  $\alpha$  concentration (qualified because of a sample holding time violation) was 13.5 mg/m<sup>3</sup>.



Too little water quality data are available to assess the *Aquatic Life Use*, therefore, it is not assessed. However, the *Aquatic Life Use* is identified with an "Alert Status" because of the elevated total phosphorus and chlorophyll  $\alpha$  concentrations.

### ***Fish Consumption***

In September 2000 fish toxics monitoring was conducted by MA DEP DWM in Tom Nevers Pond. These data can be found in Appendix B, Table B2. Because of elevated mercury concentrations, MDPH issued a fish consumption advisory recommending the following:

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Tom Nevers Pond."
2. "The general public should limit consumption of all fish from Tom Nevers Pond to two meals per month."

Due to the site-specific fish consumption advisory, the *Fish Consumption Use* is assessed as impaired.

### ***Primary and Secondary Contact Recreation***

At 11:30 a.m. on 25 September 2000 the Secchi disk depth reported by DWM, was 0.4 meters at the deep hole station. Total station depth was 1 meter.






Although the Secchi disk depth did not meet the bathing beach guidance of  $\geq 1.2$  meters, too little data are available to assess the recreational uses. Therefore, the *Primary* and *Secondary Contact Recreation Uses* are not assessed. However, *Primary Contact Recreation Use* is identified with an "Alert Status" because of the Secchi disk depth.

### ***Aesthetics***

No algal bloom, objectionable deposits, odors or floating scum were noted by DWM in 2000 during the lake survey. The very dark water color observed in Tom Nevers Pond appeared to be natural due to the bordering wetland.

Too little information is available to assess the *Aesthetics Use*, therefore, it is not assessed.

Tom Nevers Pond (MA97097) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed*
<i>Fish Consumption</i>		Impaired Cause (known): mercury Source: unknown
<i>Primary Contact</i>		Not Assessed*
<i>Secondary Contact</i>		Not Assessed
<i>Aesthetics</i>		Not Assessed

\* "Alert Status" issues identified; see details in the Use Assessment section.

### **RECOMMENDATIONS FOR TOM NEVERS POND (MA97097):**

- Continue to monitor water quality and biological (chlorophyll  $\alpha$ ) parameters necessary to assess the Aquatic Life Use of Tom Nevers Pond.
- Continue to monitor bacteria levels and water clarity in order to assess the contact recreation uses of Tom Nevers Pond.

## MARTHA'S VINEYARD

### LAKE TASHMOO (SEGMENT MA97-12)

Location: Waters including Drew Cove and Rhoda Pond to confluence with Vineyard Sound south of Herring Creek Road at channel, Tisbury, Martha's Vineyard.

Segment Area: 0.41 mi<sup>2</sup>

Classification: Class SA

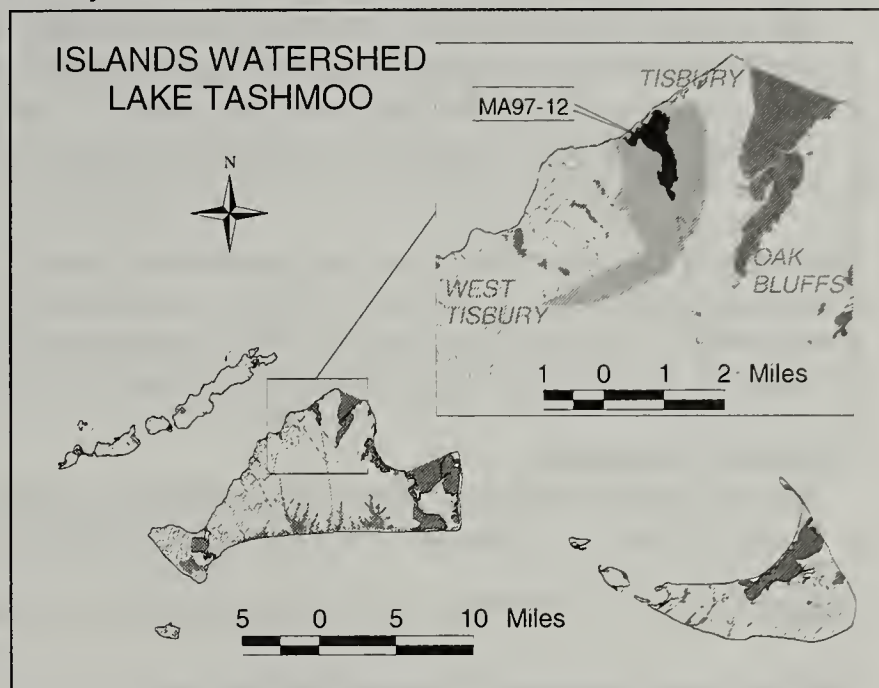
Land-use estimates (top 3, excluding water) for the 3.7 mi<sup>2</sup> Lake Tashmoo subwatershed, (map inset, gray shaded area):

Forest	60%
Residential	26%
Agriculture	6%

The Town of Tisbury manages a general access concrete boat ramp for Lake Tashmoo and parking for boat trailers at Lake Street (DFWELE 2002b).

As part of a Section 319 Nonpoint Source grant Tisbury Waterways Inc., in cooperation with the Town of Tisbury, developed a storm drain remediation scheme for a portion of the roadway surrounding and draining to Lake Tashmoo (Porter 1998). Prior to the storm drain upgrade the Town of Tisbury collected water quality samples and found significant concentrations of fecal coliform bacteria, metals, and oil and grease in the storm drain discharge. The purpose of this project was to capture and treat road runoff contributing to the contamination of Lake Tashmoo. Limited sampling post-BMP implementation indicated that the upgrade was effective at reducing these pollutants.

In 1988 the Martha's Vineyard Commission designated the Lagoon Pond District (the waters of the pond and lands within 1500 feet of the mean high water line of the pond, excluding the commercial waterfront on the West Arm and the Lagoon Harbor Park) as a District of Critical Planning Concern (DCPC) (MVC 2000). "The designation included the goals 'to maintain water quality, prevent pollution, promote wildlife habitat, promote the economic development of fisheries and related industries, and maintain and enhance recreational and other uses of Lagoon Pond and environs'. In the decision, the MVC adopted guidelines for the development of regulations for the district; and the towns adopted regulations, including regulations to control density and nutrient inputs. The Oak Bluffs Board of Health adopted a regulation limiting new construction in the District to one bedroom per 15,000 square feet of lot area, and requires, as part of the disposal works permit, information on landscaping and proposed fertilizer use on the property. The Tisbury Wetlands By-Law Regulations include Lagoon Pond DCPC regulations for fertilizer and pesticide application. 'The applications of organic and inorganic fertilizers and pesticides within 100 feet of a coastal bank, salt marsh or the 100 year flood zone adjacent to Lagoon Pond and Lake Tashmoo... is prohibited...'. A waiver procedure is defined in the regulation."



### WMA WATER WITHDRAWAL SUMMARY (APPENDIX C, TABLE C2)

Facility	WMA Permit Number	WMA Registration Number	Source	Authorized Withdrawal (MGD)	Average Withdrawal (MGD)		
					2000	2001	2002
Tisbury Water Works	9P42329601	42329602	4296000-02G 4296000-03G	0.55 reg 0.22 perm Total: 0.77 <sup>1</sup>	0.61	0.68	not avail

<sup>1</sup>indicates system-wide withdrawal, all sources are not necessarily within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no NPDES permitted discharges to Lake Tashmoo.



## USE ASSESSMENT

### ***Aquatic Life***

#### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Lake Tashmoo from historic 1951 black and white aerial photography (Costello 2003). Eelgrass beds in Lake Tashmoo were mapped by MA DEP from field verified 1994 aerial photography. Total coverage of Lake Tashmoo from the 1994 survey was approximately 30% of the lake, with the majority of eelgrass located in the southern half of Lake Tashmoo. MA DEP field verified 1999 aerial photography determined that the eelgrass bed identified in the southern portion of the lake in 1994 had declined to less than 15% coverage of the lake.

Because of the loss of eelgrass bed habitat the *Aquatic Life Use* is assessed as impaired for Lake Tashmoo. The eelgrass bed loss may be associated with nutrient enrichment (i.e., elevated nitrogen loadings) from nonpoint sources or other anthropogenic activities that result in reduced water clarity. Suspected sources of nutrient enrichment include recreational activities (boating) and septic systems.

### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that areas V8.0, V8.1 and V8.20 (which comprise this entire segment) are approved (DFWELE 2000 and Whittaker 2003a).







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support.

### ***Primary and Secondary Contact Recreation***

The Martha's Vineyard Land Bank, in cooperation with Dukes County, monitors bacteria at the bathing beach at Hillman's Point. No beach closures or postings occurred in 2001 or 2002 (Dicks 2003). The Town of Tisbury collected one dry weather and two wet weather fecal coliform bacteria samples in September and October 1997 as part of the *Lake Tashmoo Demonstration Project In-line Remediation of Contaminants from Road Runoff* (Porter 1998). Fecal coliform counts were not detected, 70 MPN/100mL and 170 MPN/100mL, with only one sample (not detected) collected during the primary contact recreation season. Prior to the installation of the first flush basins, 15 samples (13 from Lake Tashmoo and two from the storm drain pipe) were collected between October 1995 and June 1996. Counts in the lake ranged from not detected to 1400 MPN/100mL. Only four of the lake samples were collected during the primary contact season.

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses and on the beach information, the *Primary and Secondary Contact Recreation* uses are assessed as support.

Lake Tashmoo (MA97-12) Use Summary Table

Designated Uses		Status
Aquatic Life		Impaired Causes (known): estuarine bioassessments (loss of eelgrass bed habitat) Causes (suspected): total nitrogen and other anthropogenic substrate alterations Sources (suspected): recreational activities (boat traffic) and on-site treatment systems (septic systems)
Fish Consumption		Not assessed
Shellfish Harvesting		Support
Primary Contact		Support
Secondary Contact		Support
Aesthetics		Not assessed

**RECOMMENDATIONS FOR LAKE TASHMOO (MA97-12):**

- Review conclusions and recommendations in *Lake Tashmoo Demonstration Project In-line Remediation of Contaminants from Road Run-off*. Monitor water quality from storm events in the vicinity of the storm drain upgrades to insure the storm drain remediation is continuing to improve water quality.
- Continue to monitor bacteria levels to document the effectiveness of bacteria source reduction activities including treatment of stormwater discharges and the Town of Tisbury's sewer project scheduled to be completed in 2004.
- Continue to monitor eelgrass bed habitat and supplement with water quality parameters necessary to assess the *Aquatic Life Use* status of Lake Tashmoo.
- Develop a TMDL for Lake Tashmoo in accordance with the Massachusetts Estuaries Project.



## LAGOON POND (SEGMENT MA97-11)

Location: From Head of the Pond Road to confluence with Vineyard Haven Harbor at Beach Road, Tisbury/Oak Bluffs, Martha's Vineyard  
 Segment Area: 0.82 mi<sup>2</sup>  
 Classification: Class SA

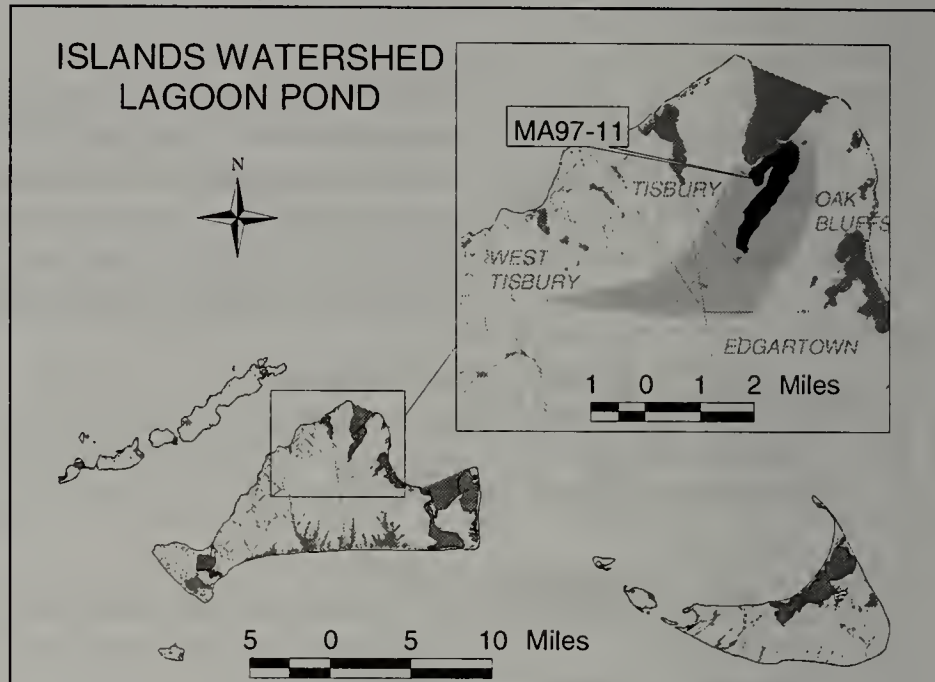
Land-use estimates (top 3, excluding water) for the 6.5 mi<sup>2</sup> subwatershed of Lagoon Pond (map inset, gray shaded area):

Forest	46%
Residential	40%
Open Land	8%

The Town of Tisbury manages a general access concrete boat ramp for Lagoon Pond and parking for boat trailers at Beach Road (DFWELE 2002b).

Although no towns in the Islands Watershed are Phase II stormwater communities, the Oak Bluffs Board of Health has adopted "Stormwater Management Regulations" that accomplish the same goals as Phase II. The regulations are intended to "properly manage stormwater by providing adequate protection against pollutants, flooding, siltation, and other drainage problems" (MVC 2000).

In 1988 the Martha's Vineyard Commission designated the Lagoon Pond District (the waters of the pond and lands within 1500 feet of the mean high water line of the pond, excluding the commercial waterfront on the West Arm and the Lagoon Harbor Park) as a District of Critical Planning Concern (DCPC) (MVC 2000). "The designation included the goals 'to maintain water quality, prevent pollution, promote wildlife habitat, promote the economic development of fisheries and related industries, and maintain and enhance recreational and other uses of Lagoon Pond and environs'. In the decision, the MVC adopted guidelines for the development of regulations for the district; and the towns adopted regulations, including regulations to control density and nutrient inputs. The Oak Bluffs Board of Health adopted a regulation limiting new construction in the District to one bedroom per 15,000 square feet of lot area, and requires, as part of the disposal works permit, information on landscaping and proposed fertilizer use on the property. The Tisbury Wetlands By-Law Regulations include Lagoon Pond DCPC regulations for fertilizer and pesticide application. 'The applications of organic and inorganic fertilizers and pesticides within 100 feet of a coastal bank, salt marsh or the 100 year flood zone adjacent to Lagoon Pond and Lake Tashmoo... is prohibited...'. A waiver procedure is defined in the regulation."



## WMA WATER WITHDRAWAL SUMMARY (APPENDIX C, TABLE C2)

Facility	WMA Permit Number	WMA Registration Number	Source	Authorized Withdrawal (MGD)	Average Withdrawal (MGD)		
					2000	2001	2002
Oak Bluffs Water Department	9P42322101	42322101	4221000-01G 4221000-03G 4221000-04G	0.58 reg <u>0.35 perm</u> Total: 0.93 <sup>1</sup>	0.84	0.88	not avail
Thimble Farm*	NA	V42329601	Thimble Farm	0.01	0.01	not avail	0.01

NA = not applicable; <sup>1</sup> indicates system-wide withdrawal, all sources are not necessarily within this segment;

NOTE: Oak Bluffs Water Department well 4221000-01G is currently offline. Well 4221000-04G went online in 2002.

\*Thimble Farm was sold and new owner has elected not to continue the voluntary registration.

## NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information, there are no NPDES permitted discharges to Lagoon Pond.

## USE ASSESSMENT

### *Aquatic Life*

#### Eelgrass Bed Habitat

MA DEP completed eelgrass mapping of Lagoon Pond from 1994 aerial photography (Costello 2003). Total eelgrass bed habitat coverage of Lagoon Pond from that survey was approximately 30% and was limited to the margins of the pond. MA DEP field verified 1999 aerial photography determined that the eelgrass beds identified along the margins of the pond in 1994 had declined to approximately 13% coverage. Most of the loss occurred along the western shoreline south of Hines Point. Additional surveys performed by the EPA in 1998 indicated a rapid state of decline in the condition of the remaining eelgrass (Colarusso 1999).

Because of the loss of eelgrass bed habitat the *Aquatic Life Use* is assessed as impaired for Lagoon Pond. The eelgrass bed loss may be associated with nutrient enrichment (i.e., elevated nitrogen loadings) from nonpoint sources or other anthropogenic activities that result in reduced water clarity. Suspected sources of nutrient enrichment include septic systems, stormwater runoff, and recreational activities (boating).

### *Shellfish Harvesting*

The DMF Shellfish Status Report of July 2000 indicates that areas V11.0, V11.1 and V11.22 (totaling 0.769 mi<sup>2</sup>) are approved, area V11.6 (0.050 mi<sup>2</sup>) is conditionally approved and area V11.2 (<0.001 mi<sup>2</sup>) is prohibited (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for 0.77 mi<sup>2</sup>, and impaired for 0.05 mi<sup>2</sup> of this segment.







### *Primary and Secondary Contact Recreation*

The Oak Bluffs Board of Health collects bacteria samples at the south end of Lagoon Pond in fulfillment of the Beaches Bill monitoring requirement (Oak Bluffs BOH 2003). No beach closures or postings have occurred in 2001 or 2002. In 2003 the Board of Health will begin collecting bacteria samples at the Sailing Camp Park mid-way through the pond on the eastern shore.

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses and on the beach information, the *Primary and Secondary Contact Recreation Uses* are assessed as support for 0.77 mi<sup>2</sup> and not assessed for 0.05 mi<sup>2</sup> this segment.



Lagoon Pond (MA97-11) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Impaired Causes (known): estuarine bioassessments (loss of eelgrass habitat) Causes (suspected): total nitrogen and other anthropogenic substrate alterations Sources (suspected): on-site treatment systems (septic systems), stormwater, and recreational activities (boat traffic)
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Support 0.77 mi <sup>2</sup> Impaired 0.05 mi <sup>2</sup> Cause (known): fecal coliform bacteria Source (suspected): on-site treatment systems (septic systems)
<i>Primary Contact</i>		Support 0.77 mi <sup>2</sup> Not Assessed 0.05 mi <sup>2</sup>
<i>Secondary Contact</i>		Support 0.77 mi <sup>2</sup> Not Assessed 0.05 mi <sup>2</sup>
<i>Aesthetics</i>		Not Assessed

#### RECOMMENDATIONS FOR LAGOON POND (MA97-11):

- Continue to monitor eelgrass bed habitat and supplement with water quality parameters (including diurnal dissolved oxygen) necessary to assess the *Aquatic Life Use* status of Lagoon Pond.
- Continue to monitor bacteria levels to document effectiveness of bacteria source reduction activities including the Town of Tisbury's sewer project scheduled to be completed in 2004.
- Investigate implementing speed and frequency regulations on boat traffic in order to minimize eelgrass bed habitat loss.
- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Review and implement, as appropriate, recommendations from MVC's *Nutrient Loading to Lagoon Pond* including (MVC 2000):
  - Encourage advanced nitrogen removal for new septic systems.
  - Maximize acquisition or protection of much of the remaining open space in the watershed.
  - Investigate and remediate stormdrains identified as contributing to nutrient and bacteria loadings in Lagoon Pond. Document effectiveness of limestone catch basin remediation at Mud Creek.
  - Encourage low-nitrogen farm activities where practical.
  - Promote shellfish as nutrient consumers, along with herring. Ensure that their habitats are protected.
- Develop a TMDL for Lagoon Pond in accordance with the Massachusetts Estuaries Project.

## VINEYARD HAVEN HARBOR (SEGMENT MA97-09)

Location: From confluence with Lagoon Pond at Beach Road to an imaginary line drawn from West Chop Light, Tisbury to East Chop Light, Oak Bluffs, Tisbury/Oak Bluffs, Martha's Vineyard

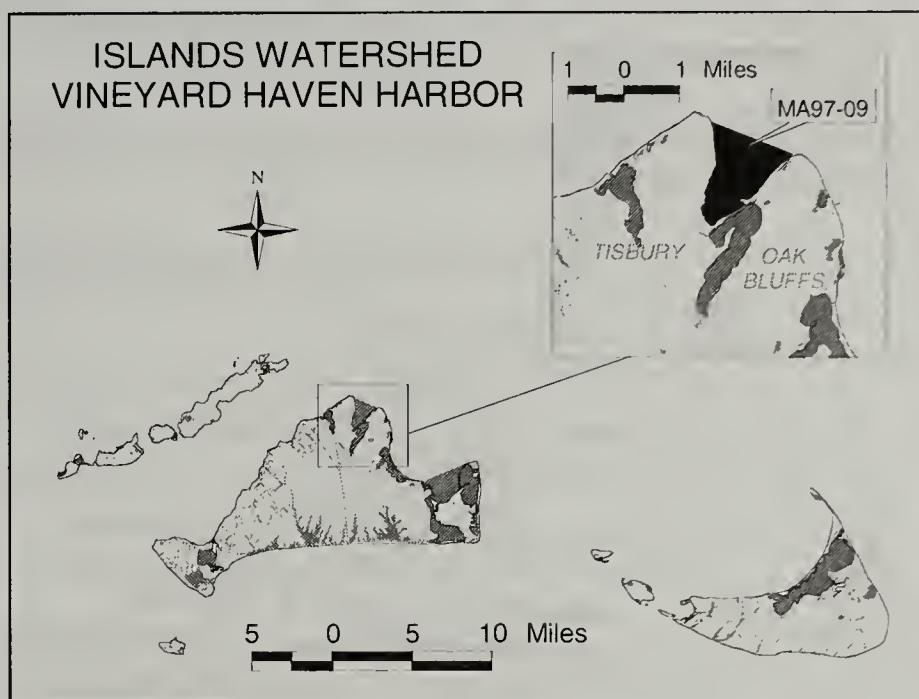
Segment Area: 1.5 mi<sup>2</sup>

Classification: Class SA

Vineyard Haven Harbor is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

The subwatershed for Vineyard Haven Harbor has not been identified; therefore land use estimates cannot be determined.

Although no towns in the Islands Watershed are Phase II stormwater communities, the Oak Bluffs Board of Health has adopted "Stormwater Management Regulations" that accomplish the same goals as Phase II. The regulations are intended to "properly manage stormwater by providing adequate protection against pollutants, flooding, siltation, and other drainage problems" (MVC 2000).



### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on Vineyard Haven Harbor. However, a pumpout boat funded by Clean Vessel Act providing free pumpouts is located in Vineyard Haven (CZM 2002).

### USE ASSESSMENT

#### ***Aquatic Life***

##### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Vineyard Haven Harbor from historic 1951 black and white aerial photography (Costello 2003). MA DEP mapped eelgrass beds twice in Vineyard Haven Harbor from field verified 1994 and 1999 aerial photography. An eelgrass bed identified in 1994 as present in the southeastern corner had decreased in size by 40% by the 1999 survey.

Too little data are available; therefore, the *Aquatic Life Use* is not assessed for Vineyard Haven Harbor. However, the loss identified from 1994 to 1999 indicates a possible decline in water quality, so the *Aquatic Life Use* is identified with an "Alert Status".

#### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that areas V10.0 and V10.20, which contain this entire segment, are conditionally approved (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this entire segment.









### **Primary and Secondary Contact Recreation**

The Town of Tisbury monitors water quality at two public beaches (Owen Park Beach and Tisbury Town Beach) in Vineyard Haven Harbor. No beach closures occurred in 2000 or 2001 and each beach was closed for only one day in 2002 (Tisbury BOH, 2003). The Town of Oak Bluffs monitors water quality at one beach (Eastville Point Beach) in Vineyard Haven Harbor. No beach closures or postings occurred in 2000, 2001 or 2002 (Culbert 2003).

Based on the public beach closure information, the *Primary* and *Secondary Contact Recreation Uses* are assessed as support.

Vineyard Haven Harbor (MA97-09) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed*
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Impaired Cause (known): fecal coliform bacteria Source: unknown
<i>Primary Contact</i>		Support
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Not Assessed

\* "Alert Status" issue identified; see details in the Use Assessment section.

### **RECOMMENDATIONS FOR VINEYARD HAVEN HARBOR (MA97-09):**

- Continue to monitor bacteria levels to document effectiveness of bacteria source reduction activities including the Town of Tisbury's sewer project scheduled to be completed in 2004.
- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Continue to monitor eelgrass bed habitat and supplement with water quality parameters necessary to assess the *Aquatic Life Use* status of Vineyard Haven Harbor.

## OAK BLUFFS HARBOR (SEGMENT MA97-07)

Location: North of Lake Avenue to confluence with Nantucket Sound, Oak Bluffs, Martha's Vineyard

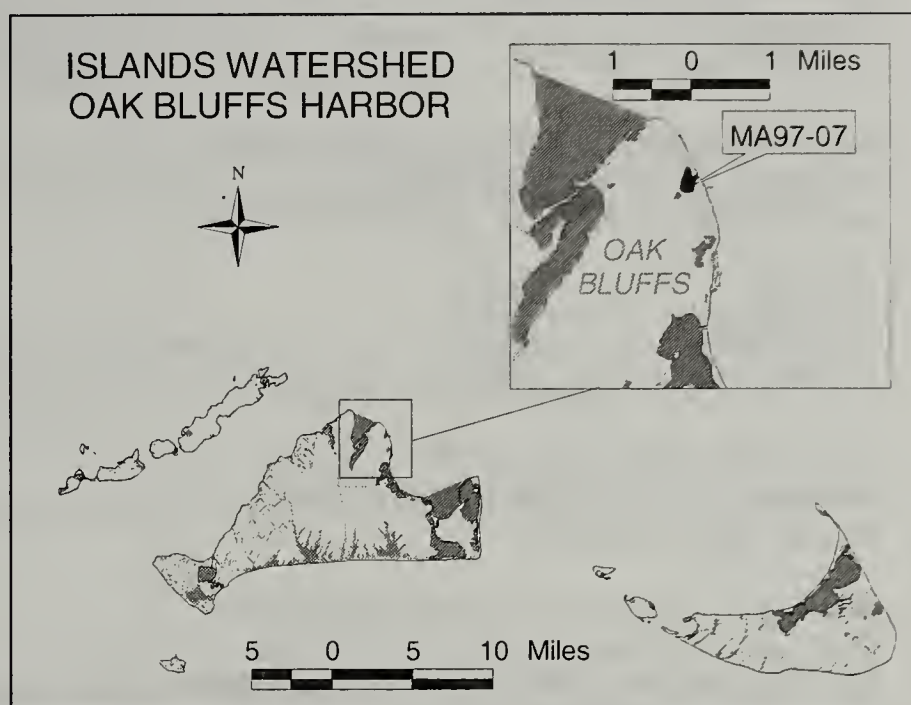
Segment Area: 0.05 mi<sup>2</sup>

Classification: Class SA

Oak Bluffs Harbor is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

A subwatershed for Oak Bluffs Harbor is not available; therefore, land-use estimates cannot be determined.

Although no towns in the Islands Watershed are Phase II stormwater communities, the Oak Bluffs Board of Health has adopted "Stormwater Management Regulations" that accomplish the same goals as Phase II. The regulations are intended to "properly manage stormwater by providing adequate protection against pollutants, flooding, siltation, and other drainage problems" (MVC 2000).



### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on Oak Bluffs Harbor. However, the Oak Bluffs Harbor Marina operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).







### USE ASSESSMENT

#### *Shellfish Harvesting*

The DMF Shellfish Status Report of July 2000 indicates that areas V14.4, V14.20, V14.21, and V14.24; which comprise this entire segment; are conditionally approved (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this entire segment.

Oak Bluffs Harbor (MA97-07) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
						
Status	Not Assessed	Not Assessed	Impaired Cause (known): fecal coliform bacteria Source: unknown	Not Assessed	Not Assessed	Not Assessed

### RECOMMENDATIONS FOR OAK BLUFFS HARBOR (MA97-07):

- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.



## SENGEKONTACKET POND (SEGMENT MA97-10)

Location: Between East Vineyard Haven Road and Beach Road, including Major's Cove, Edgartown/Oak Bluffs, Martha's Vineyard  
 Segment Area: 1.1 mi<sup>2</sup>  
 Classification: Class SA

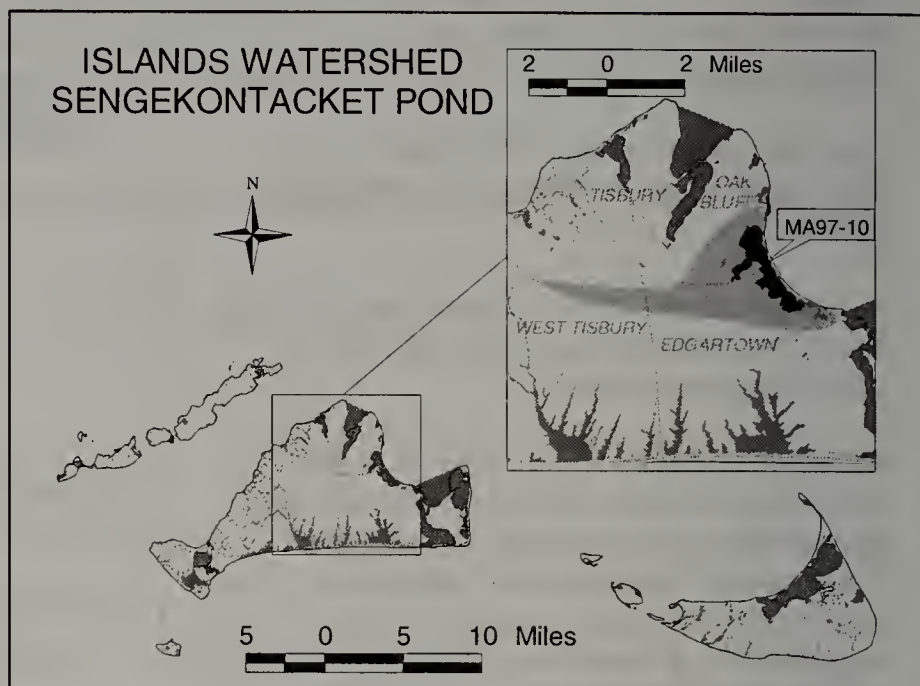
Land-use estimates (top 3, excluding water) for the 8.2 mi<sup>2</sup> Sengekontacket Pond subwatershed (map inset, gray shaded area):

Forest	49%
Residential	26%
Open Land	18%

Sengekontacket Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

Although no towns in the Islands Watershed are Phase II stormwater communities, the Oak Bluffs Board of Health has adopted "Stormwater Management Regulations" that accomplish the same goals as Phase II. The regulations are intended to "properly manage stormwater by providing adequate protection against pollutants, flooding, siltation, and other drainage problems" (MVC 2000).

The Town of Oak Bluffs manages a concrete pad ramp system fisherman's access on Sengekontacket Pond for small boats and parking for boat trailers at Beach Road (DFWELE 2002b). Additionally cartop access at Pulpit Rock Road (Pecoy Point) is managed by the Martha's Vineyard Land Bank (MVLB).



### WMA WATER WITHDRAWAL SUMMARY (APPENDIX C, TABLE C2)

Facility	WMA Permit Number	WMA Registration Number	Source	Authorized Withdrawal (MGD)	Average Withdrawal (MGD)		
					2000	2001	2002
Edgartown Water Department	9P42308901	42308901	4089000-05G (Lily Pond well)	0.65 reg 0.27 perm Total: 0.92 <sup>2</sup>	0.76	0.84	not avail
Farm Neck Golf Club <sup>1</sup>	NA	42322102	2 groundwater points	0.16	0.14	0.14	0.25 <sup>3</sup>

NA = not applicable; <sup>1</sup> indicates average withdrawal over less than 365 days; <sup>2</sup> indicates system-wide withdrawal, all sources are not necessarily within this segment; <sup>3</sup> withdrawal did not exceed registration amount by more than 0.1 MGD (WMA threshold)

### NPDES WASTEWATER DISCHARGE SUMMARY

There are no regulated wastewater discharges to this segment. However, the town of Edgartown operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).

### USE ASSESSMENT:

#### Aquatic Life

##### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Sengekontacket Pond from historic 1951 black and white aerial photography (Costello 2003). Two eelgrass beds were identified, but are currently nonexistent. Eelgrass beds in Sengekontacket Pond were mapped by MA DEP from field verified 1994 aerial photography. Only one eelgrass bed (in the southern portion of Major's Cove), approximately 0.01mi<sup>2</sup> (1% of the pond), was identified in that survey. An eelgrass bed survey was performed in 1998 under the auspices of the Oak Bluffs Conservation Commission with funding from the Massachusetts Department of Environmental Management, Lakes and Ponds Program and the Martha's Vineyard Commission (Wilcox and Hempy 1998). The same eelgrass bed identified by MA DEP in 1994 was

mapped as having extended north in Majors Cove resulting in eelgrass presence in the entire western portion of Majors Cove (patchy to low density in the northern portion and medium to high density in the southern portion). The Oak Bluffs Conservation Commission's study identified the presence of background levels of wasting disease in Sengekontacket Pond and suggests that the poor productivity of eelgrass beds may be due to disease and not a result of poor water quality.

Although eelgrass bed habitat data are available for Sengekontacket Pond, too little information is available on the cause of decline in the eelgrass beds. Therefore, the *Aquatic Life Use* is not assessed, but identified with an "Alert Status".

### **Shellfish Harvesting**







The DMF Shellfish Status Report of July 2000 indicates that areas V16.0, V16.4, V16.20, V16.22, V16.23, V16.25, V16.26, V16.27, V16.28, and V16.29, all of which comprise this segment, are approved (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for this entire segment.

### **Primary and Secondary Contact Recreation**

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support for this segment.

Sengekontacket Pond (MA97-10) Use Summary Table

<i>Designated Uses</i>	<i>Aquatic Life</i>	<i>Fish Consumption</i>	<i>Shellfish Harvesting</i>	<i>Primary Contact</i>	<i>Secondary Contact</i>	<i>Aesthetics</i>
						
<i>Status</i>	Not Assessed*	Not Assessed	Support	Support	Support	Not Assessed

\* "Alert Status" issue identified, see Use Assessment section

### **RECOMMENDATIONS FOR SENGEKONTACKET POND (MA97-10):**

- Work with Friends of Sengekontacket to promote stewardship and to address their "Issues of Concern for 2002 – 2004", including (FOS 2003):
  - "Threats to water quality from non-point pollution such as road and roof runoff, septic systems, and applications of landscape products,
  - the effect of Trapps Pond on water quality in Sengekontacket, recommendations for redesign of the Beach Road culvert, and restoration of the historic herring run,
  - maintenance of shellfishery,
  - assessment of erosion and shoaling.
  - protection of habitat for rare and endangered shore birds, such as least terns, common terns, roseate terns, and piping plovers,
  - large scale die-back of eel grass, and
  - impact of various recreational watercraft on the pond and living things in the pond."
- Continue to monitor eelgrass bed habitat and supplement with water quality parameters necessary to assess the *Aquatic Life Use* status of Sengekontacket Pond.
- Develop a TMDL for Sengekontacket Pond in accordance with the Massachusetts Estuaries Project.



## CAPE POGE BAY (SEGMENT MA97-08)

Location: From Pease Pond and The Lagoon to the confluence with Edgartown Harbor at the Cape Poge Gut (excluding Shear Pin Pond), Edgartown, Martha's Vineyard

Segment Area: 2.3 mi<sup>2</sup>

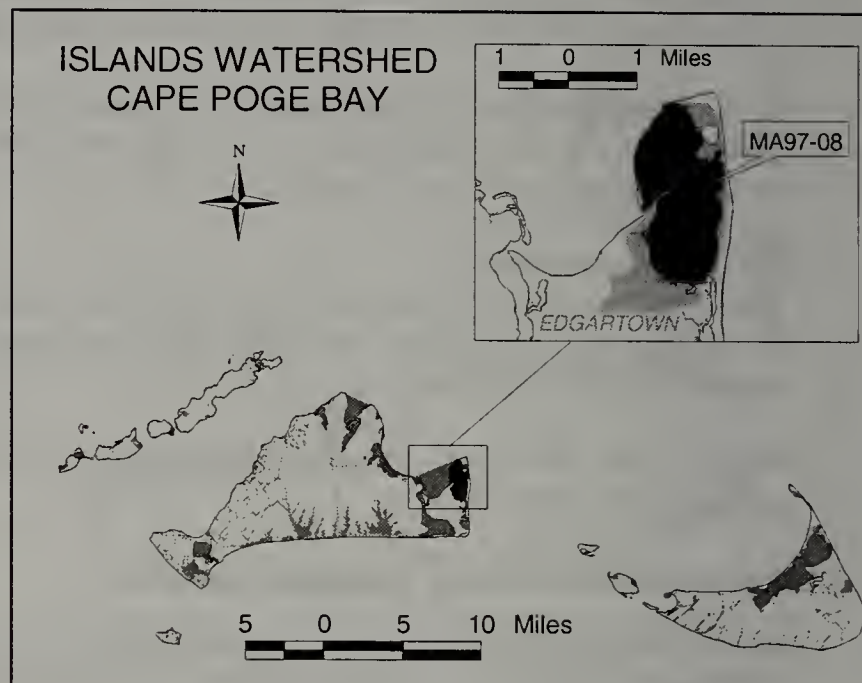
Classification: Class SA

Land-use estimates (top 3, excluding water) for the 3.6 mi<sup>2</sup> Cape Poge Bay subwatershed (map inset, gray shaded area):

Forest	40%
Open Land	28%
Wetlands	14%

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on or in the watershed for Cape Poge Bay. However, the Town of Edgartown operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).



### USE ASSESSMENT

#### ***Aquatic Life***

##### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Cape Poge Bay from historic 1951 black and white aerial photography (Costello 2003). MA DEP mapped eelgrass beds in Cape Poge Bay from field verified 1994 aerial photography. Three small beds identified from 1951 photos in the southern portion of the bay were nonexistent during the 1994 survey. In 1994 an eelgrass bed in the northern half of the bay covered approximately 40% of the bay and another sparse bed covered with red-brown algae was present in the southern tip of the bay. MA DEP field verified 1999 aerial photography showed a slight decline in eelgrass bed coverage (to approx 30%) in Cape Poge Bay since the 1994 survey.

Too little data are available; therefore, the *Aquatic Life Use* is not assessed for Cape Poge Bay. However, the appearance of eelgrass loss in the lower bay indicates a possible decline in water quality, so the *Aquatic Life Use* is identified with an "Alert Status".

#### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that area V21.0, which contains this entire segment, is approved (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support.

#### ***Primary and Secondary Contact Recreation***

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support for this segment.

Cape Poge Bay (MA97-08) Use Summary Table

Designated Uses	<i>Aquatic Life</i>	<i>Fish Consumption</i>	<i>Shellfish Harvesting</i>	<i>Primary Contact</i>	<i>Secondary Contact</i>	<i>Aesthetics</i>
Status	Not Assessed*	Not Assessed	Support	Support	Support	Not Assessed

\* "Alert Status" issue identified, see Use Assessment section.

### RECOMMENDATIONS FOR CAPE POGE BAY (MA97-08):

- Continue to monitor eelgrass bed habitat and supplement with water quality parameters necessary to assess the *Aquatic Life Use* status of Cape Poge Bay.
- Develop a TMDL for Sengekontacket Pond in accordance with the Massachusetts Estuaries Project.

## MATTAKESSET BAY (SEGMENT MA97-14)

Location: Waters from shoreline to an imaginary line drawn southeast from Katama Point to Norton Point, Edgartown, Martha's Vineyard

Segment Area: 0.17 mi<sup>2</sup>

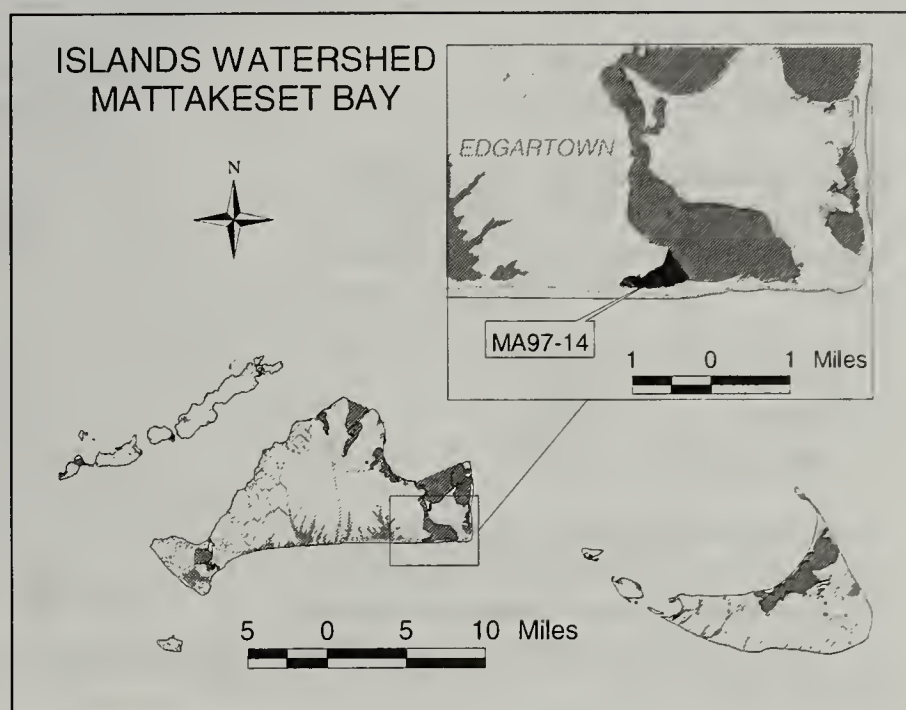
Classification: Class SA

The Mattakeset Bay subwatershed is included as part of the subwatershed for Katama Bay. Land use estimates are not available for Mattakeset Bay.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

The Mattakeset Bay watershed is included as part of the watershed area for Katama Bay. (See Katama Bay (MA97-16) for a list of water withdrawals or NPDES discharges that may also apply to this segment.)

Additionally, the Town of Edgartown operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).



### USE ASSESSMENT

#### Shellfish Harvesting







The DMF Shellfish Status Report of July 2000 indicates that area V20.0, which contains this entire segment, is approved (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for this entire segment.

#### Primary and Secondary Contact Recreation

Based on the more stringent bacteria guidelines for Shellfish Harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support for this segment.

Mattakeset Bay (MA97-14) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
						
Status	Not Assessed	Not Assessed	Support	Support	Support	Not Assessed



## KATAMA BAY (SEGMENT MA97-16)

Location: From an imaginary line drawn southeast from Katama Point to Norton Point, to an imaginary line drawn from Dock Street to Chappaquiddick Point (excluding Caleb Pond), Edgartown, Martha's Vineyard

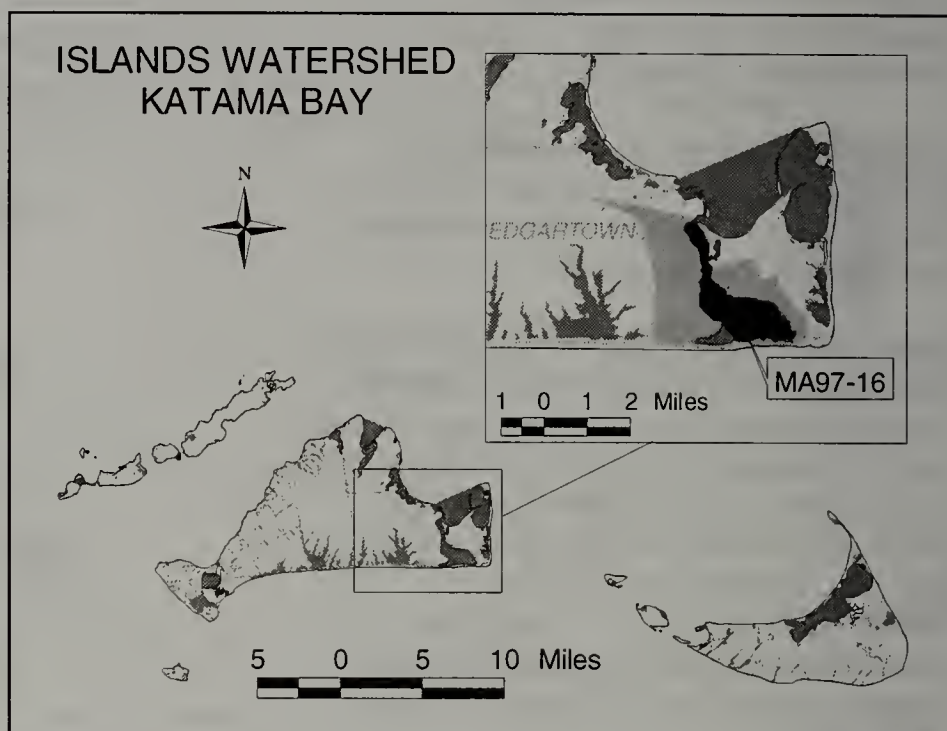
Segment Area: 2.0 mi<sup>2</sup>

Classification: Class SA

Land-use estimates (top 3, excluding water) for the 7.1 mi<sup>2</sup> Katama Bay subwatershed (map inset, gray shaded area):

Residential	35%
Forest	28%
Open Land	20%

The Town of Edgartown manages a concrete ramp fisherman's access on Katama Bay for small boats and parking for boat trailers at Edgartown Bay Road (DFWELE 2002b).



### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on or in the watershed for Katama Bay. However, The Town of Edgartown operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).

### USE ASSESSMENT

#### ***Aquatic Life***

##### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Katama Bay from historic 1951 black and white aerial photography (Costello 2003). A field survey performed by MA DEP in 1998 revealed no eelgrass in the entire bay.

Although eelgrass bed habitat data are available, criteria for *Aquatic Life Use* assessment based on eelgrass and other water quality indicators are still being developed. Therefore, the *Aquatic Life Use* is not assessed. However, the loss of eelgrass beds in the bay indicates a possible decline in water quality and therefore, the *Aquatic Life Use* is identified with an "Alert Status".

#### ***Shellfish Harvesting***

The DMF Shellfish Status Report of July 2000 indicates that areas V19.0 and V20.0 (which contain 1.8 mi<sup>2</sup> of this segment) are approved and area V19.1 (which contains 0.2 mi<sup>2</sup> of this segment) is conditionally approved (DFWELE 2000).







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for 1.8 mi<sup>2</sup> of this segment and impaired for 0.2 mi<sup>2</sup> of this segment.

#### ***Primary and Secondary Contact Recreation***

Bacteria samples are collected from Katama Bay by the Trustees of the Reservation at the beach in the southeast corner of the bay and by the Town of Edgartown at the boat ramp at the end of Herring Creek.

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses (public bathing beaches are located in an approved shellfish harvesting area), the *Primary and Secondary Contact Recreation Uses* are assessed as support for 1.8mi<sup>2</sup> of this segment and not assessed for 0.2 mi<sup>2</sup> of this segment.

Katama Bay (MA97-16) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed*
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Support 1.8 mi <sup>2</sup> , Impaired 0.24 mi <sup>2</sup> Cause (known): fecal coliform bacteria Source: unknown
<i>Primary Contact</i>		Support 1.8 mi <sup>2</sup> , Not Assessed 0.2 mi <sup>2</sup>
<i>Secondary Contact</i>		Support 1.8 mi <sup>2</sup> , Not Assessed 0.2 mi <sup>2</sup>
<i>Aesthetics</i>		Not Assessed

\* "Alert Status" issue identified, see Use Assessment section.

#### RECOMMENDATIONS FOR KATAMA BAY (MA97-16):

- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Continue to monitor eelgrass bed habitat in order to assess the *Aquatic Life Use* status of Katama Bay. Perform water quality monitoring to determine if the loss of eelgrass beds in Katama Bay is due to excessive nutrients.
- Develop a TMDL for Katama Bay in accordance with the Massachusetts Estuaries Project.



## EDGARTOWN HARBOR (SEGMENT MA97-15)

Location: Waters from Cape Poge Gut and from an imaginary line drawn from Dock Street to Chappaquiddick Point to an imaginary line drawn northeast from the point at the end of Plantingfield Way to Cape Poge Elbow (excluding Eel Pond), Edgartown, Martha's Vineyard

Segment Area: 3.1 mi<sup>2</sup>

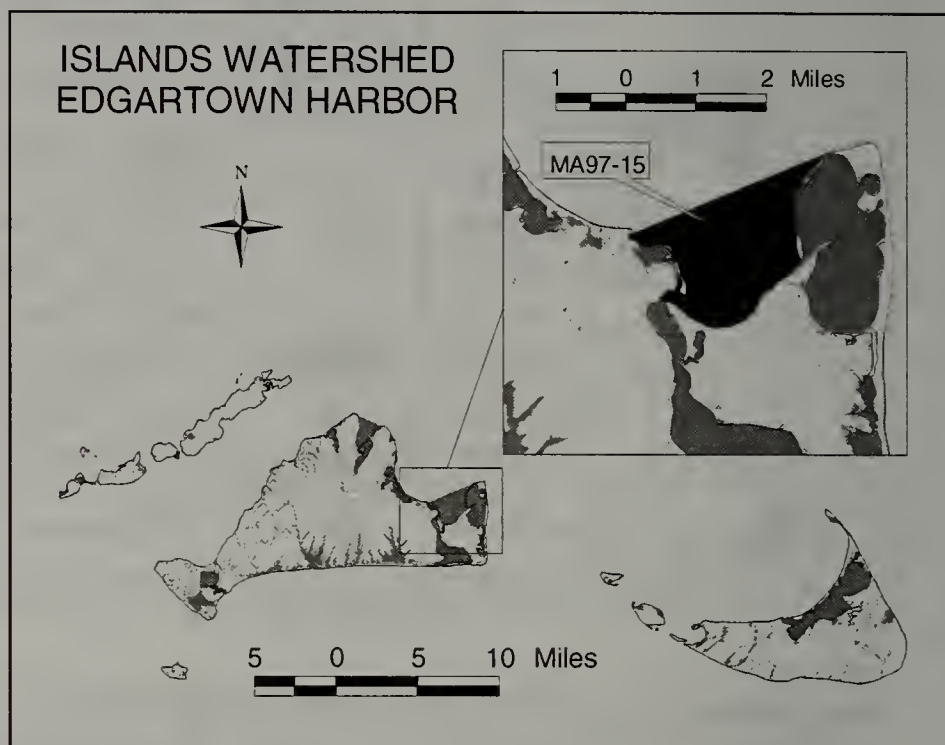
Classification: Class SA

The Edgartown Harbor subwatershed has not been identified; therefore, land-use estimates cannot be determined.

Edgartown Harbor is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information, there are no WMA regulated water withdrawals or NPDES permitted discharges in Edgartown Harbor. However, the Town of Edgartown operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).



## USE ASSESSMENT

### *Aquatic Life*

#### Eelgrass Bed Habitat

MA DEP identified the presence of eelgrass in Edgartown Harbor from historic 1951 black and white aerial photography (Costello 2003). MA DEP mapped eelgrass beds in Edgartown Harbor from field verified 1994 aerial photography. MA DEP field verified 1999 aerial photography showed a large decline in eelgrass bed coverage along the eastern shore of the harbor.

Too little data are available; therefore, the *Aquatic Life Use* is not assessed for Edgartown Harbor.

### *Shellfish Harvesting*

The DMF Shellfish Status Report of July 2000 indicates that areas V13.0, V17.0 and V18.0 (which contain 3.0 mi<sup>2</sup> of this segment) are approved and area V19.1 (which contains 0.1 mi<sup>2</sup> of this segment) is conditionally approved (DFWELE 2000).







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for 3.0mi<sup>2</sup> of this segment and impaired for 0.1mi<sup>2</sup> of this segment.

### *Primary and Secondary Contact Recreation*

The Edgartown Land Bank collects bacteria samples from Chappy Point Beach in Edgartown Harbor. No beach closures or postings occurred in 2001 or 2002 (Dicks 2003).

Based on the public beach information (Chappy Point Beach is located in the conditionally approved shellfish harvesting area) and the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support for this entire segment

Edgartown Harbor (MA97-15) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Support 3.0 mi <sup>2</sup> , Impaired 0.1 mi <sup>2</sup> Cause (known): fecal coliform bacteria Source: unknown
<i>Primary Contact</i>		Support
<i>Secondary Contact</i>		Support
<i>Aesthetics</i>		Not Assessed

**RECOMMENDATIONS FOR EDGARTOWN HARBOR (MA97-15):**

- Continue to monitor eelgrass bed habitat and supplement with water quality parameters necessary to assess the *Aquatic Life Use* status of Edgartown Harbor.
- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Develop a TMDL for Edgartown Harbor in accordance with the Massachusetts Estuaries Project.



## EDGARTOWN GREAT POND (SEGMENT MA97-17)

Location: Including Jobs Neck Cove, Jane's Cove, Wintucket Cove, Mashacket Cove, Turkeyland Cove, Slough Cove, and Butler's Cove, Edgartown, Martha's Vineyard

Segment Area: 1.4 mi<sup>2</sup>

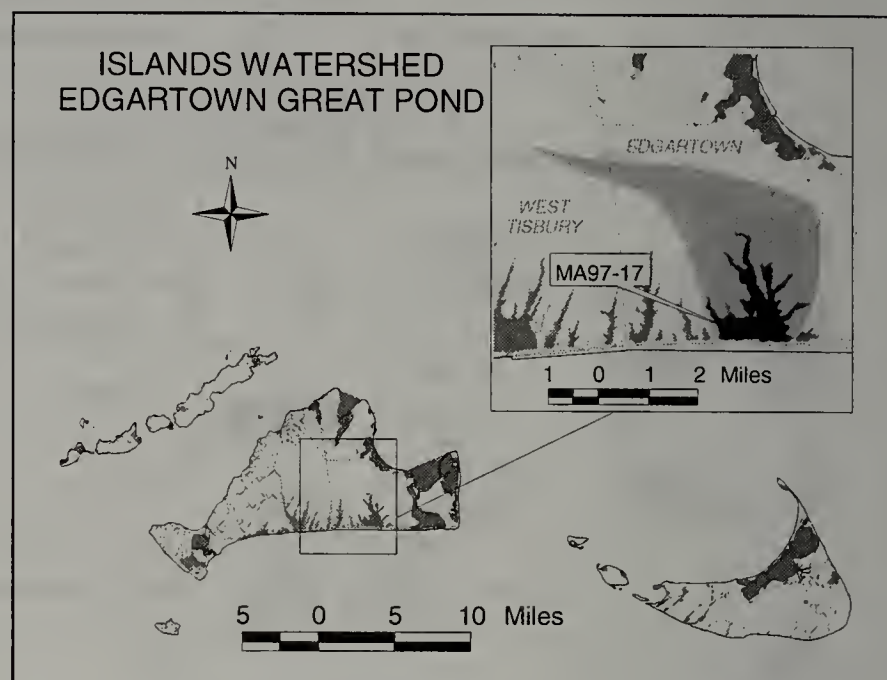
Classification: Class SA

Land-use estimates (top 3, excluding water) for the 9.9 mi<sup>2</sup> Edgartown Great Pond subwatershed (map inset, gray shaded area):

Forest	59%
Open Land	12%
Residential	10%

### WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no NPDES permitted surface discharges to Edgartown Great Pond. However, the Town of Edgartown operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).



Edgartown Wastewater Treatment Facility has a groundwater discharge permit (SE #2-24) issued 5 May 1999 and expires 5 April 2004 (Mezzacappa 2003). The startup date for the new facility was 22 April 1996 and there have been no permit violations since the upgrade. "Current discharges into the Edgartown Great Pond Watershed, from the Edgartown Wastewater Treatment Facility, fall well below the allowed asset allocation, for nitrogen loading, allowed to the watershed from the plant. The typical monthly reporting value for total nitrogen is <4 mg/L with a seasonal discharge rate ranging from 6,000 GPD to 23,000 GPD."

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX C, TABLE C2)

Facility	WMA Permit Number	WMA Registration Number	Source	Authorized Withdrawal (MGD)	Average Withdrawal (MGD)		
					2000	2001	2002
Edgartown Water Department	9P42308901	42308901	4089000-06G 4089000-07G	0.65 reg 0.27 perm Total: 0.92 <sup>1</sup>	0.76	0.84	not avail
Vineyard Golf Club	9P24230890	NA	Irrigation Well	0.15	0.07	0.08	0.1

NA = not applicable; <sup>1</sup> indicates system-wide withdrawal, all sources are not necessarily within this segment

### USE ASSESSMENT

#### Shellfish Harvesting

The DMF Shellfish Status Report of July 2000 indicates that area V26.0, which contains this entire segment, is conditionally approved (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is impaired for this entire segment.

Edgartown Great Pond (MA97-17) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
Status	Not Assessed	Not Assessed	Impaired Cause (known): Fecal coliform bacteria Source: unknown	Not Assessed	Not Assessed	Not Assessed

### RECOMMENDATIONS FOR EDGARTOWN GREAT POND (MA97-17):

- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Develop a TMDL for Edgartown Great Pond in accordance with the Massachusetts Estuaries Project.

## OYSTER POND (SEGMENT MA97-13)

Location: Including Ripley Cove, Edgartown, Martha's Vineyard

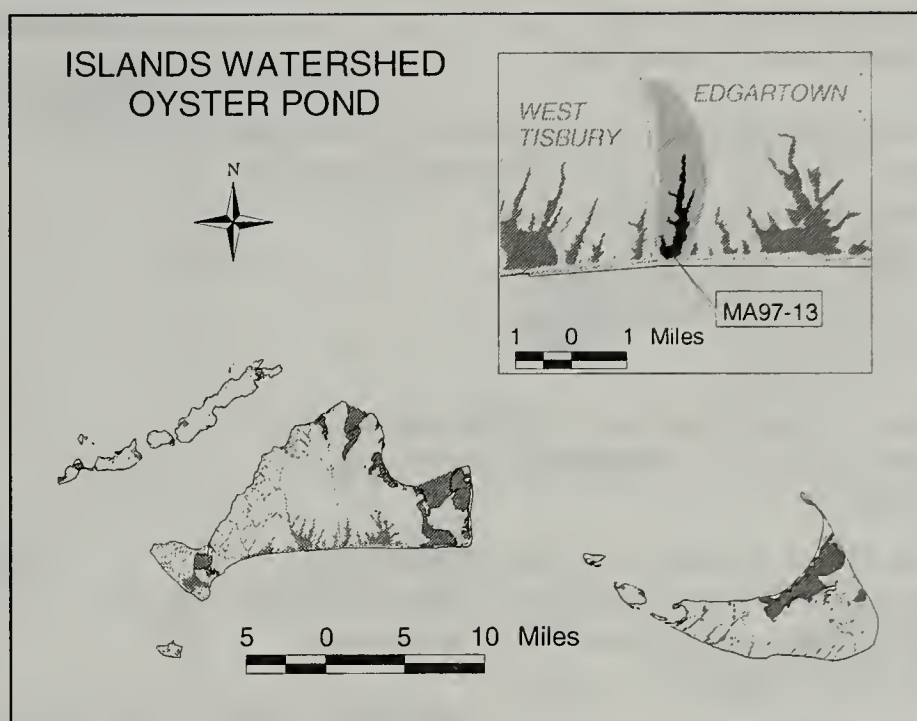
Segment Area: 0.29 mi<sup>2</sup>

Classification: Class SA

Land-use estimates (top 3, excluding water) for the 2.3mi<sup>2</sup> Oyster Pond subwatershed (map inset, gray shaded area):

Forest	61%
Open Land	13%
Residential	6%

Oyster Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).



### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on or in the watershed for Oyster Pond. However, the Town of Edgartown operates a pumpout boat funded by Clean Vessel Act and provides free pumpouts (CZM 2002).







### USE ASSESSMENT

#### Shellfish Harvesting

The DMF Shellfish Status Report of February 2003 indicates that area V29.0, which contains this entire segment, is under management closure (Whittaker 2003b).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is not assessed.

Oyster Pond (MA97-13) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
						
Status	Not Assessed					

### RECOMMENDATIONS FOR OYSTER POND (MA97-13):

- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Develop a TMDL for Oyster Pond in accordance with the Massachusetts Estuaries Project.



## TISBURY GREAT POND (SEGMENT MA97-18)

Location: Including Town Cove, Muddy Cove, Pear Tree Cove, Short Cove, Tiah Cove, Tississa Pond, Deep Bottom Cove, and Thumb Cove, Chilmark/West Tisbury, Martha's Vineyard

Segment Area: 1.1 mi<sup>2</sup>

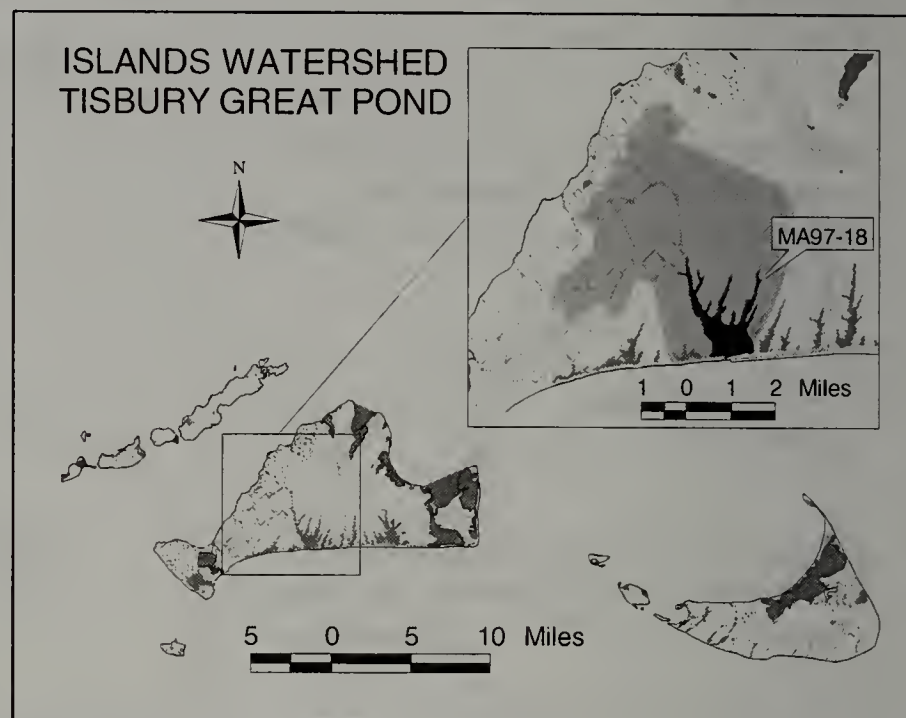
Classification: Class SA

Land-use estimates (top 3, excluding water) for the 18.3 mi<sup>2</sup> Tisbury Great Pond subwatershed (map inset, gray shaded area):

Forest	57%
Residential	14%
Open Land	12%

Tisbury Great Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

The MVLB manages a gravel fisherman's access on Tisbury Great Pond and parking for boat trailers at Sepiessa Point Reservation (DFWELE 2002b).



## WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on or in the Tisbury Great Pond watershed.

## USE ASSESSMENT

### Shellfish Harvesting

The DMF Shellfish Status Report of July 2000 indicates that area V31.0 (0.80 mi<sup>2</sup>) is approved, area V31.5 (0.20 mi<sup>2</sup> of this segment) is conditionally approved and areas V31.3 and V31.4 (which include 0.10 of this segment) are prohibited (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for 0.80 mi<sup>2</sup> of this segment and impaired for 0.30 mi<sup>2</sup> of this segment.

### Primary and Secondary Contact Recreation

The Edgartown Land Bank and The Trustees of the Reservation collect bacteria samples from two beaches (Sepiessa Point Beach and Long Point Wildlife Refuge) on Tisbury Great Pond. No beach closures or postings occurred at Sepiessa Point Beach in 2001 or 2002 (Dicks 2003).

Based on the more stringent guidelines for shellfish harvesting than for recreational uses (both beaches are located in approved shellfish harvesting areas), the *Primary and Secondary Contact Recreation Uses* are assessed as support for 0.80 mi<sup>2</sup> of this segment and not assessed for 0.30 mi<sup>2</sup> of this segment.

Tisbury Great Pond (MA97-18) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
Status	Not Assessed	Not Assessed	Support 0.80mi <sup>2</sup> Impaired 0.30mi <sup>2</sup> Cause (known): Fecal coliform bacteria Source: unknown	Support 0.80mi <sup>2</sup> , Not Assessed 0.30mi <sup>2</sup>		Not Assessed

## RECOMMENDATIONS FOR TISBURY GREAT POND (MA97-18):

- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Develop a TMDL for Tisbury Great Pond in accordance with the Massachusetts Estuaries Project.

## CHILMARK POND (SEGMENT MA97-05)

Location: South of South Road including Wades Cove and Gilberts Cove, Chilmark, Martha's Vineyard.

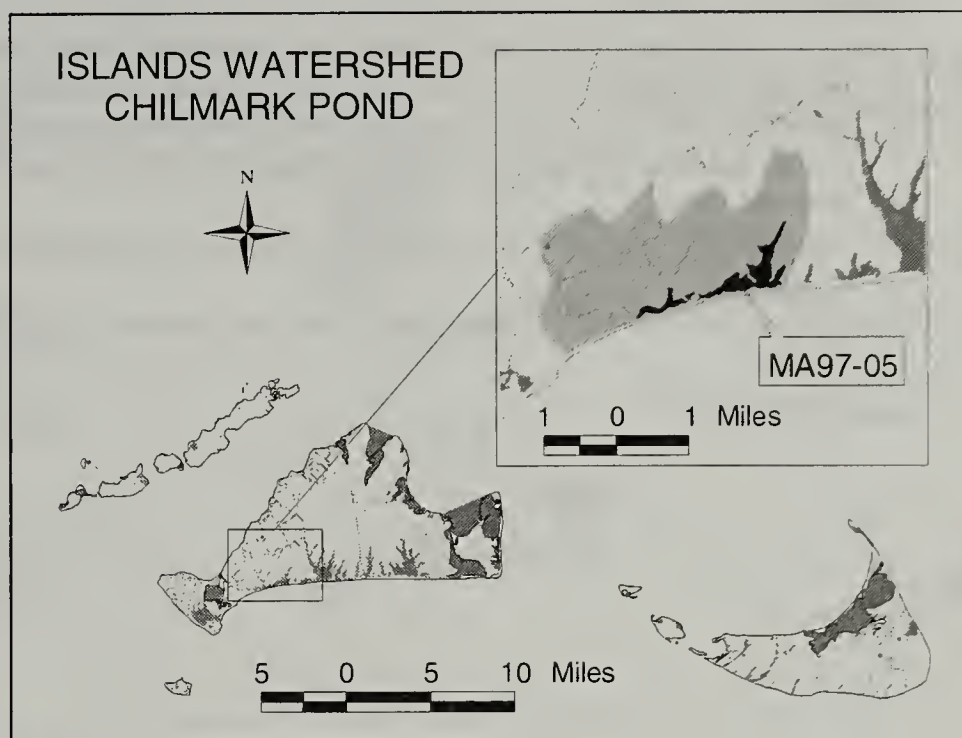
Segment Area: 0.31 mi<sup>2</sup>

Classification: Class SA

Chilmark Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

Land-use estimates (top 3, excluding water) for the 5.4 mi<sup>2</sup> Chilmark Pond subwatershed (map inset, gray shaded area):

Forest	47%
Residential	19%
Open Land	19%



### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on or in the watershed for Chilmark Pond.

### USE ASSESSMENT

#### Shellfish Harvesting

The DMF Shellfish Status Report of July 2000 indicates that area V32.0, which contains this entire segment, is prohibited (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is impaired for this entire segment.

#### Primary Contact Recreation

Secchi disk depth readings were performed by the Martha's Vineyard Commission at 10 stations in Chilmark Pond on three occasions in May and June 1999 and on two occasions in July and August 2000 (MVC 2001a). The majority of readings that did not touch the bottom of the pond were <4 feet (the bathing beach guidance).

Although a sufficient number of Secchi disk depth readings were taken not all readings were taken during MA DEP DWM's recommended measuring time of 10:00 am to 4:00 pm; therefore, the *Primary Contact Recreation Use* is not assessed. However, it is identified with an "Alert Status".

Chilmark Pond (MA97-05) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
Status	Not Assessed	Not Assessed	Impaired Cause (known): Fecal coliform bacteria Source: unknown	Not Assessed*	Not Assessed	Not Assessed

\*"Alert Status" issue identified; see details in Use Assessment section.



**RECOMMENDATIONS FOR CHILMARK POND (MA97-05):**

- Review and implement, as appropriate, recommendations from DMF shellfish survey program reports.
- Review and implement, as appropriate, recommendations from MVC's *Chilmark, Menemsha & Squibnocket Ponds: Nutrient Loading and Recommended Management Program* including:
  - survey fish populations and assess the timing of openings to enhance herring run,
  - evaluate pond circulation and options to enhance water quality through better circulation/flushing,
  - public outreach to abutting landowners regarding the use of fertilizers and planting of native grasses, and
  - encourage the use of nitrogen removing on-site sewage treatment.
- Develop a TMDL for Chilmark Pond in accordance with the Massachusetts Estuaries Project.

## MENEMSHA POND (SEGMENT MA97-06)

Location: From mouth of Menemsha Creek to confluence with Nashaquitsa Pond, Gay Head, Martha's Vineyard

Segment Area: 0.89 mi<sup>2</sup>

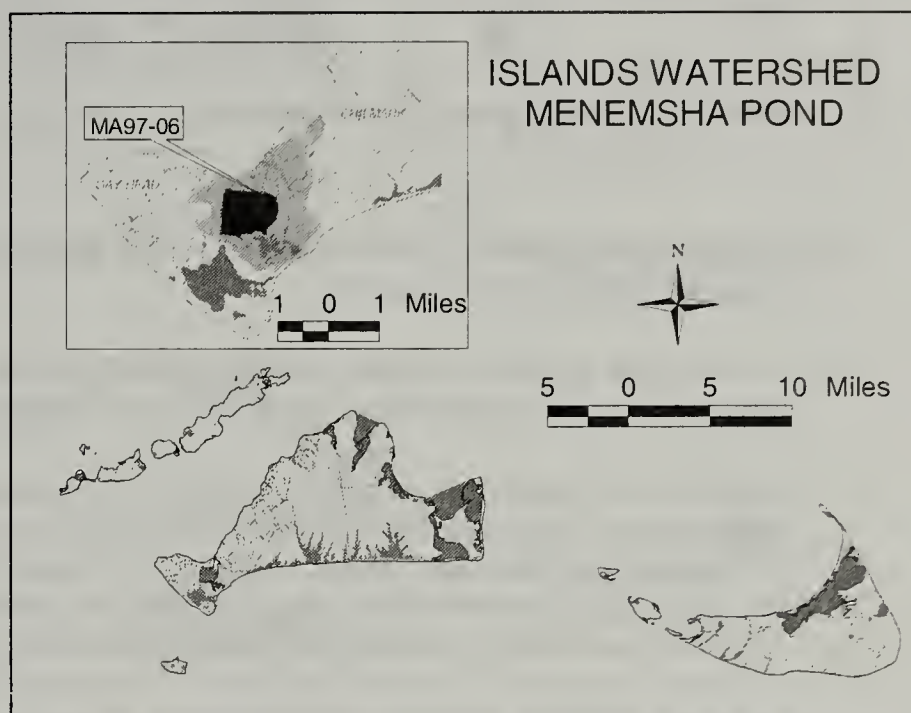
Classification: Class SA

Menemsha Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

According to the Martha's Vineyard Commission, "Menemsha Pond is strongly flushed and circulated by tidal currents. The tide is sufficient enough to exchange the volume of the pond every three days". (MVC 2001a)

Land-use estimates (top 3, excluding water) for the 4.1 mi<sup>2</sup> Menemsha Pond subwatershed (map inset, gray shaded area):

Forest	33%
Open Land	31%
Residential	27%



### WMA WATER WITHDRAWAL SUMMARY

Based on the available information there are no WMA regulated water withdrawals on or in the watershed for Menemsha Pond.

### NPDES WASTEWATER DISCHARGE SUMMARY

USCG-Menemsha, Permit Number MA0090590 discharges treated sanitary wastewater to Fresh Pond that is located in the watershed for Menemsha Pond. The permit is currently draft and will be issued in 2003. Wampanoag Aquinnah Shellfish Hatchery applied for a NPDES permit (MA0110337), however, it was determined that the discharge is below the threshold for a permit, therefore, no permit is required (Hogan 2003). The Town of Chilmark operates a pumpout boat on Menemsha Pond (CZM 2002).

### USE ASSESSMENT

#### *Shellfish Harvesting*

The DMF Shellfish Status Report of July 2000 indicates that area V2.0, which contains this entire segment, is approved (DFWELE 2000).







Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as support for this entire segment.

#### *Primary and Secondary Contact Recreation*

Based on the more stringent bacteria guidelines for shellfish harvesting than for recreational uses, the *Primary and Secondary Contact Recreation Uses* are assessed as support for this segment.



Menemsha Pond (MA97-06) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
						
Status	Not Assessed	Not Assessed	Support	Support	Support	Not Assessed

**RECOMMENDATIONS FOR MENEMSHA POND (MA97-06):**

- Reissue USCG NPDES permit.
- Re-evaluate the 303(d) listing of Menemsha Pond for pathogens due to the fact that the shellfish growing area is approved and the contact recreational uses are subsequently supported.
- Review and implement, as appropriate, recommendations from MVC's *Chilmark, Menemsha & Squibnocket Ponds: Nutrient Loading and Recommended Management Program* including:
  - survey eelgrass bed habitat and perform diurnal dissolved oxygen profiles,
  - encourage the use of nitrogen removing on-site sewage treatment, and
  - enhance shellfish productivity as a means to remove nutrients.
- Develop a TMDL for Menemsha Pond in accordance with the Massachusetts Estuaries Project.

## SETHS POND (SEGMENT MA97085)

Location: West Tisbury  
Segment Size: 11 acres  
Classification: Class B

A subwatershed for Seths Pond is not available; therefore, land-use estimates cannot be determined.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on Seths Pond.

### USE ASSESSMENT

#### *Aquatic Life*

In July, August and September 2001 Martha's Vineyard Commission collected water quality information from Seths Pond (MVC 2001b). Field data collected includes: temperature, specific conductivity, dissolved oxygen, percent DO saturation, pH, alkalinity, aluminum, chlorophyll  $\alpha$ , total phosphorus, and total nitrogen.

Since there are no obvious anthropogenic nutrient sources the *Aquatic Life Use* is not assessed. However, it is identified with an "Alert Status" because of moderate total phosphorus concentrations, low dissolved oxygen in the hypolimnion, and an algal bloom identified in late July to mid-August 2001.

#### *Fish Consumption*

In October 1995 fish toxics monitoring was conducted by DWM in Seths Pond. These data can be found in Appendix B, Table B1. No fish consumption advisory was issued, although mercury was elevated in several of the samples analyzed.

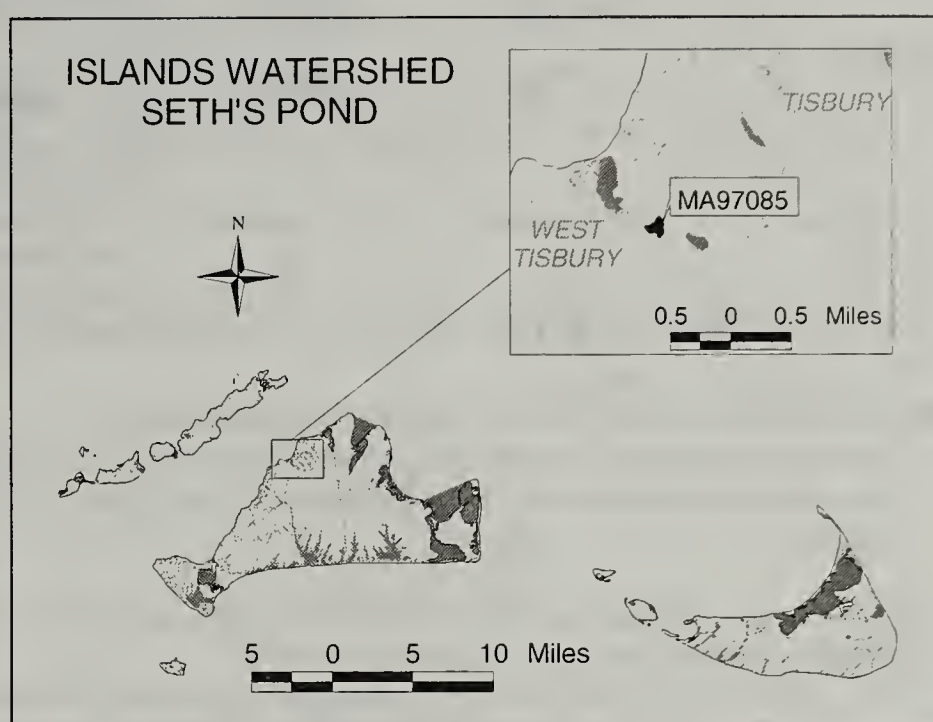
Based on this information, the *Fish Consumption Use* is not assessed. However, it is identified with an "Alert Status" because of elevated mercury concentrations.

#### *Primary and Secondary Contact Recreation and Aesthetics*

The West Tisbury Board of Health collects bacteria samples from the town beach on Seths Pond. No beach closures or postings have occurred in 2001 or 2002 (Powers 2003).






In July, August and September 2001 MVC collected Secchi disk depth measurements from Seths Pond (MVC 2001b). On two dates in August (06 August and 20 August) Secchi disk measurements were below the bathing beach guidance of 4 feet.

Based on the Secchi disk depth measurements, the *Primary Contact Recreation Use* is assessed as impaired. Based on the presence of an algal bloom in late July to mid-August, the *Secondary Contact Recreation and Aesthetics uses* are not assessed; however, they are identified with an "Alert Status".





Seths Pond (MA97085) Use Summary Table

	<i>Aquatic Life</i>	<i>Fish Consumption</i>	<i>Primary Contact</i>	<i>Secondary Contact</i>	<i>Aesthetics</i>
<i>Designated Uses</i>					
<i>Status</i>	Not Assessed*	Not Assessed*	Impaired Cause (known): Secchi disk transparency Source: Unknown	Not Assessed*	Not Assessed*

\*"Alert Status" issues identified; see details in Use Assessment section.

#### RECOMMENDATIONS FOR SETHS POND (MA97085):

- Additional fish toxics monitoring is recommended to provide MDPH with sufficient samples (i.e., composite samples of top level predators) to determine the need for a site-specific fish consumption advisory.
- Review and implement, as appropriate, recommendations from *Seths Pond: Present Water Quality and Proposed Management Plan* including:
  - Limit runoff and sediment discharge from driveways sloping to Lambert's Cove Road by requiring design and construction of diversions, infiltration swales or leaching facilities satisfactory to the Town.
  - Maintain existing roadside discharge shoots.
  - At the time Lambert's Cove Road is to be paved, shape the road to obtain better discharge to roadside grassed swales or infiltration basins to minimize the amount of storm runoff reaching the bottom of the hill.
  - Maintain the infiltrative capacity of the gravel infiltration swale at the pond edge by periodically removing accumulated silt, organic matter and other fine debris.
  - Educate abutting homeowners about low maintenance landscaping options and encourage them to use minimal amounts of slow release lawn fertilizer.
  - Inspect sewage disposal systems that are elevated 10 feet or less above the pond level. Consider dye testing these systems to evaluate their potential impact on the pond.

## MILL BROOK (SEGMENT MA97-22)

Location: Outlet of Bliss Pond to the confluence of Chilmark Pond, Chilmark, Martha's Vineyard

Segment Length: 2.4 miles

Classification: Class B

The Mill Brook subwatershed has not been identified; therefore land use estimates are not available.

DFWELE has proposed that Mill Brook be reclassified in the SWQS as a cold water fishery (DFWELE 2001).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals on or NPDES permitted discharges to Mill Brook.

### USE ASSESSMENT

#### ***Aquatic Life***

##### Biology

In June 2000 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey at one station (MB01) on Mill Brook, approximately 800 meters upstream from Chilmark Pond (Appendix A). The regional reference station (PB01) for this survey was located on Paint Mill Brook in Chilmark. The benthic community analysis indicated a "non-impacted" assessment for biological condition at station MB01. The total metric score for the MB01 macroinvertebrate assemblage indicated 95% comparability to the reference station at Paint Mill Brook, exhibiting balanced community composition and good trophic structure.

##### Habitat

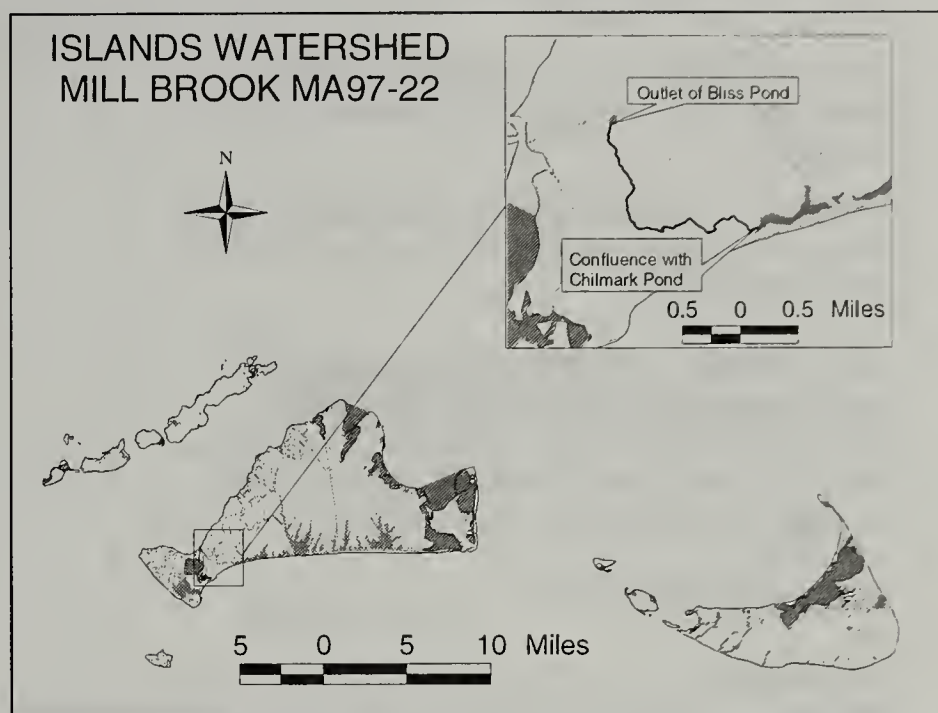
The habitat evaluation at DWM's station MB01 was 90% comparable to the reference station, PB01 (Appendix A). The sampling reach was mostly shaded with excellent fish habitat and riffles with cobble/pebble substrates that provided macroinvertebrates with excellent epifaunal habitat. Instream vegetation was minimal and consisted mainly of aquatic mosses on cobble substrates. Although not severe, habitat degradation in the form of sediment deposition compromises aquatic habitat in this portion of Mill Brook.

Based on the benthic community analysis (non-impacted), the *Aquatic Life Use* is assessed as support.






#### ***Aesthetics***

No objectionable aesthetic conditions (i.e., odors, scum, etc.) were noted by DWM in 2000 during the benthic macroinvertebrate survey (Appendix A).

Based on this information, the *Aesthetics Use* is assessed as support.



Mill Brook (MA97-22) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
					
Status	Support	Not Assessed	Not Assessed	Not Assessed	Support

### RECOMMENDATIONS FOR MILL BROOK (MA97-22):

- Review and implement recommendations from MA DEP's *Islands 2000 Biological Assessment* (Appendix A). Specifically, "bacteria sampling throughout the Mill Brook subwatershed may help to isolate sources of bacteria responsible for the 303(d) listing of Mill Brook's receiving water, Chilmark Pond".



## PAINT MILL BROOK (SEGMENT MA97-23)

Location: Source east of Tea Lane to confluence with Paint Mill Brook Pond, Chilmark, Martha's Vineyard

Segment Length: 0.81 miles

Classification: Class B

The Paint Mill Brook subwatershed has not been identified; therefore, land use estimates are not available.

DFWELE has proposed that Paint Mill Brook be reclassified in the SWQS as a cold water fishery (DFWELE 2001).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges to Paint Mill Brook.

### USE ASSESSMENT

#### *Aquatic Life*

##### Biology

In June 2000 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey at one station (PB01) on Paint Mill Brook, approximately 130 meters downstream from North Road, Chilmark (Appendix A). Station PB01 was chosen as the regional reference station for this survey due to its habitat evaluation, presumed good water quality, and minimal upstream or adjacent land use impacts. Station PB01 was characterized by a macroinvertebrate assemblage indicating a healthy aquatic community with metric values indicative of clean water and "least-impacted" conditions. The PB01 benthic community received a total metric score of 40 out of a possible score of 42, placing it in the "non-impacted" category for biological condition.

##### Habitat

The habitat evaluation at DWM's station PB01 revealed a mostly shaded sampling reach with excellent fish cover and an abundance of rocky substrates providing excellent epifaunal habitat for macroinvertebrates (Appendix A). The high quality habitat observed at station PB01 corroborates its status as a reference station in the watershed.






Based on the benthic community analysis (non-impacted), the *Aquatic Life Use* is assessed as support.

#### *Aesthetics*

No objectionable aesthetic conditions (i.e., odors, scum, etc.) were noted by DWM in 2000 during the benthic macroinvertebrate survey (Appendix A).

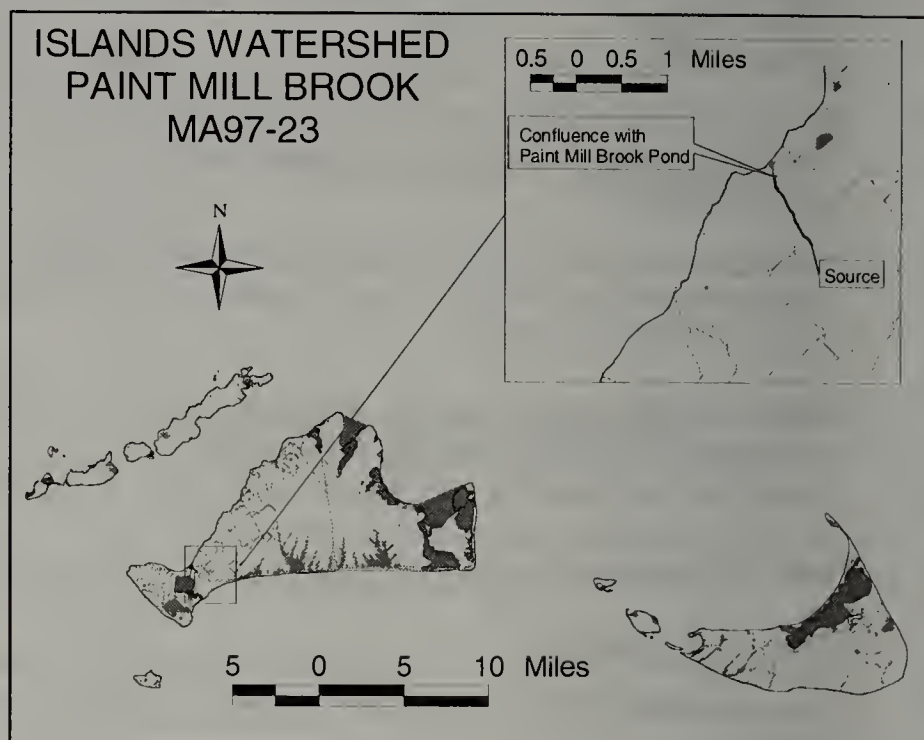
Based on this information, the *Aesthetics Use* is assessed as support.

Paint Mill Brook (MA97-23) Use Summary Table

Designated Uses	<i>Aquatic Life</i>	<i>Fish Consumption</i>	<i>Primary Contact</i>	<i>Secondary Contact</i>	<i>Aesthetics</i>
					
Status	Support	Not Assessed	Not Assessed	Not Assessed	Support

### RECOMMENDATIONS FOR PAINT MILL BROOK (MA97-23):

- Review and implement recommendations from MA DEP's *Islands 2000 Biological Assessment* (Appendix A). Specifically, "the possibility of the North Road crossing as a source of sediment inputs should be investigated, as should the need for best management practices (BMPs) that may help to minimize the effects of road runoff in this portion of Paint Mill Brook."



## MILL BROOK (SEGMENT MA97-24)

Location: Source in wetlands west of Roth Woodland Road Chilmark to confluence with Old Millpond, West Tisbury, Martha's Vineyard  
Segment Length: 1.6 miles  
Classification: Class B

The Mill Brook subwatershed has not been identified; therefore, land-use estimates cannot be determined.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals on or NPDES permitted discharges to Mill Brook.

### USE ASSESSMENT

#### *Aquatic Life*

##### Biology

In June 2000 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey at one station (MI01), approximately 110 meters downstream from Panhandle Road, West Tisbury (Appendix A). The MI01 benthos assemblage received the lowest metric score of the biomonitoring stations in the Martha's Vineyard survey, representing 55% comparability to the reference community at station PB01. The resulting assessment, "slightly impacted", fell into the lowest end of that biological condition category (slightly impacted = 54% - 79% comparable to reference). Overall habitat quality at MI01 was comparable to reference conditions suggesting that water quality limits biological potential in this portion of Mill Brook.

In June 2000 DFWLE MassWildlife performed fish population monitoring at two sites on Mill Brook (station 249 upstream from Scotchman's Lane, West Tisbury and station 250 below Mill Pond, downstream from State Road and Garden Club, West Tisbury) (Richards 2003). A total of 13 fish representing three species (in order of abundance), tessellated darters (6 fish), American eels (4) and golden shiners (3) were identified at station 249. A total of 77 fish representing four species (in order of abundance), American eels (58), brown bullheads (9), tessellated darters (6) and golden shiners (4) were identified at station 250.

##### Habitat

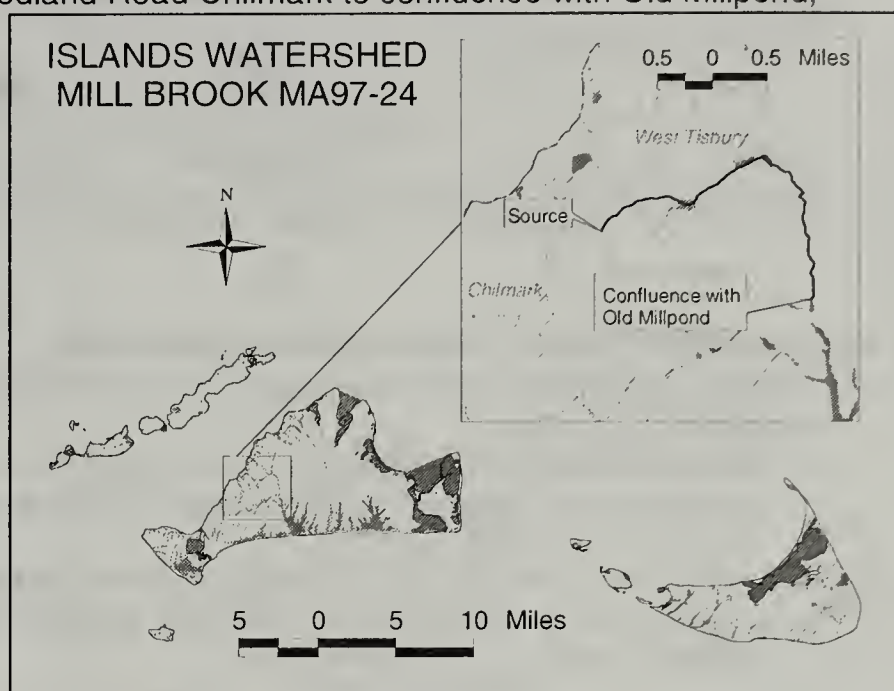
The habitat evaluation at DWM's station MI01 revealed a mostly shaded sampling reach with virtually no exposed substrate (Appendix A). Fish cover was optimal and epifaunal habitat for macroinvertebrates was good with additional benthic habitat provided by dense instream moss growth on cobble substrates. The total habitat assessment score was highly comparable to habitat quality at the reference station, PB01.

Based on the benthic community analysis (slightly impacted), the *Aquatic Life Use* is assessed as support. However, due to the relatively low comparability of the MI01 benthos to the reference community, observed instream turbidity, and a habitat evaluation (comparable to the reference site) that suggests water quality limitations, the *Aquatic Life Use* is identified with an "Alert Status".

##### *Aesthetics*






No objectionable aesthetic conditions (i.e., odors, scum, etc.) were noted by DWM in 2000 during the benthic macroinvertebrate survey (Appendix A).

Based on this information, the *Aesthetics Use* is assessed as support.





Mill Brook (MA97-24) Use Summary Table

<i>Designated Uses</i>	<i>Aquatic Life</i>	<i>Fish Consumption</i>	<i>Primary Contact</i>	<i>Secondary Contact</i>	<i>Aesthetics</i>
					
<i>Status</i>	Support*	Not Assessed	Not Assessed	Not Assessed	Support

\* "Alert Status" issue identified, see Use Assessment section.

#### RECOMMENDATIONS FOR MILL BROOK (MA97-24):

- Review and implement recommendations from MA DEP's *Islands 2000 Biological Assessment* (Appendix A), including:
  - water quality monitoring throughout the Mill Brook subwatershed, especially nutrient and bacteria sampling, may help to isolated sources of nutrient/organic loads to Mill Brook and pathogens in Tisbury Great Pond; and
  - outreach on nonpoint source pollution associated with agricultural practices (e.g., fertilizers and other runoff, bank erosion) is warranted, especially for those farms minimally buffered from the stream.

## TIASQUAM RIVER (SEGMENT MA97-25)

Location: Source in wetlands west of Tea Lane, Chilmark to confluence with Looks Pond, West Tisbury, Martha's Vineyard

Segment Length: 2.5 miles

Classification: Class B

The Mill Brook subwatershed has not been identified; therefore, land-use estimates cannot be determined.

DFWELE has proposed that Tiasquam River be reclassified in the SWQS as a coldwater fishery (DFWELE 2001).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals on or NPDES permitted discharges to Tiasquam River.

### USE ASSESSMENT

#### *Aquatic Life*

##### Biology

In June 2000 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey at one station (TR01), approximately 110 meters downstream from Tiasquam Lane, West Tisbury, on the Tiasquam River (Appendix A). The benthic community analysis indicated a "slightly impacted" assessment for biological condition at station TR01. The total metric score for the TR01 macroinvertebrate assemblage indicated 70% comparability to the reference station at Paint Mill Brook. The presence of numerous chironomids, as well as filter-feeding taxa may be indicative of organic enrichment in this portion of Tiasquam River. Significant deposits of fine particulate organic matter (FPOM) throughout the sampling reach corroborate the effects of enrichments at TR01.

##### Habitat

DWM's habitat evaluation revealed optimal channel flow status with water reaching the base of both banks and leaving virtually no exposed substrates (Appendix A). However, riffle areas were somewhat limited in the mostly shaded, run-dominated reach, providing adequate, but less than optimal habitat for macroinvertebrates. Fish habitat was also slightly less than optimal, with occasional boulders providing the majority of the cover. Instream vegetation and algal cover were fairly minimal. Substrate embeddedness, due to both organic and inorganic deposition, and riparian disruption along the east bank were the most negatively affected habitat parameters.






Based on the benthic community analysis (slightly impacted), the *Aquatic Life Use* is assessed as support.

#### *Aesthetics*

No objectionable aesthetic conditions (i.e., odors, scum, etc.) were noted by DWM in 2000 during the benthic macroinvertebrate survey (Appendix A).

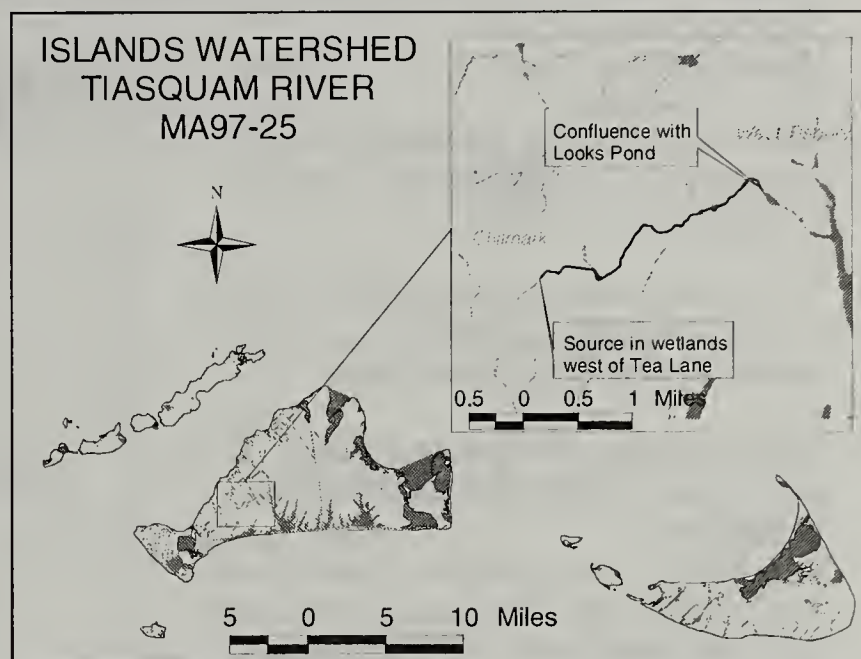
Based on this information, the *Aesthetics Use* is assessed as support.

Tiasquam River (MA97-25) Use Summary Table

Designated Uses	<i>Aquatic Life</i>	<i>Fish Consumption</i>	<i>Primary Contact</i>	<i>Secondary Contact</i>	<i>Aesthetics</i>
					
Status	Support	Not Assessed	Not Assessed	Not Assessed	Support

### RECOMMENDATIONS FOR TIASQUAM RIVER (MA97-25):

- Review and implement recommendations in MA DEP's *Islands (Martha's Vineyard) 2000 Biological Assessment* (Appendix A). Specifically, "sampling for bacteria and nutrients may help to isolate sources (e.g., agricultural runoff) of nutrient/organic loads to the Tiasquam River and pathogens in Tisbury Great Pond".





## GOSNOLD ISLANDS

### WESTEND POND (GOSNOLD POND) (SEGMENT MA97-20)

Location: Cuttyhunk Island, Gosnold, Elizabeth Islands

Segment Area: 0.10 mi<sup>2</sup>

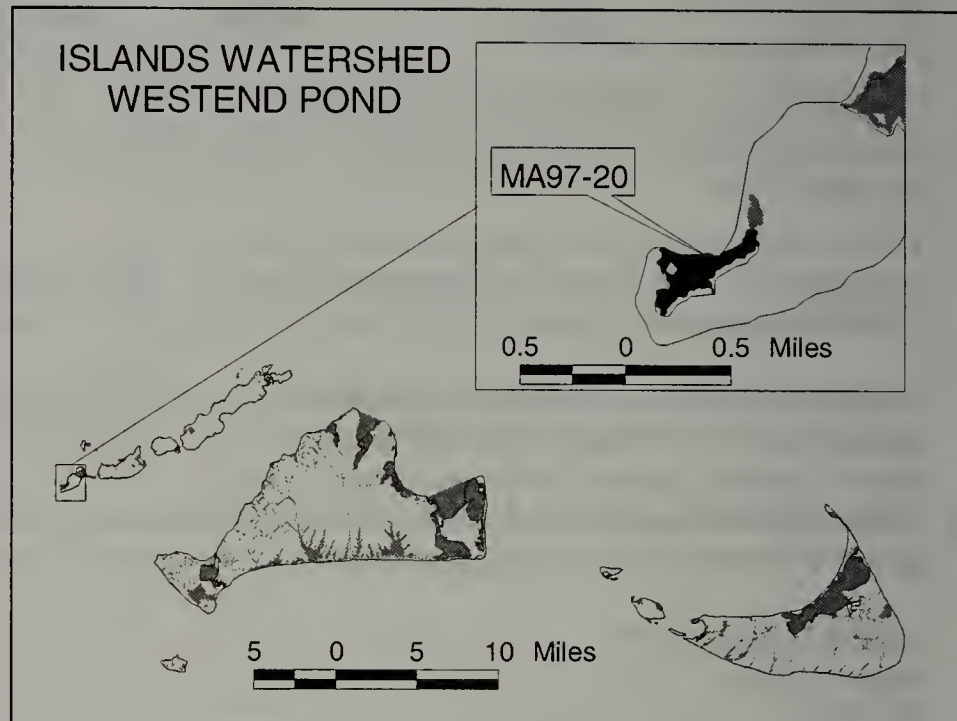
Classification: Class SA

Westend Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

The subwatershed for Westend Pond has not been identified; therefore, land-use estimates cannot be determined.

#### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES permitted discharges on Westend Pond.









#### USE ASSESSMENT

##### *Shellfish Harvesting*

The DMF Shellfish Status Report of July 2000 indicates that area E10.0 which contains this entire segment is conditionally approved (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is impaired for this segment.

Westend Pond (MA97-20) Use Summary Table

<i>Designated Uses</i>		<i>Status</i>
<i>Aquatic Life</i>		Not Assessed
<i>Fish Consumption</i>		Not Assessed
<i>Shellfish Harvesting</i>		Impaired Cause (known): fecal coliform bacteria Source: unknown
<i>Primary Contact</i>		Not Assessed
<i>Secondary Contact</i>		Not Assessed
<i>Aesthetics</i>		Not Assessed

#### RECOMMENDATIONS FOR WESTEND POND (MA97-20):

- Review and implement as appropriate recommendations from DMF shellfish survey program reports.

## CUTTYHUNK POND (SEGMENT MA97-21)

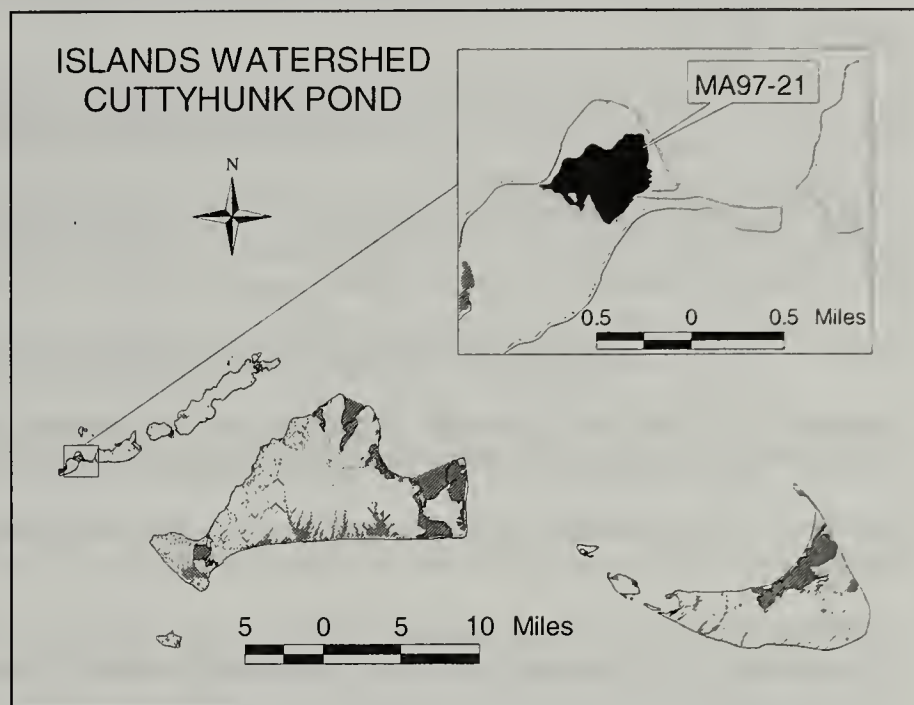
Location: Waters to the western extent of the channel connecting Cuttyhunk Pond to Cuttyhunk Harbor, Gosnold, Elizabeth Islands  
 Segment Area: 0.15 mi<sup>2</sup>  
 Classification: Class SA

Cuttyhunk Pond is on the Massachusetts 1998 303(d) List of Waters for pathogens (Table 2).

The subwatershed for Cuttyhunk Pond has not been identified; therefore, land-use estimates cannot be determined.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information, there are no WMA regulated water withdrawals on or NPDES permitted discharges to Cuttyhunk Pond.



## USE ASSESSMENT

### Aquatic Life

#### Eelgrass bed habitat

MA DEP identified the presence of eelgrass in Cuttyhunk Pond from historic 1951 black and white aerial photography (Costello 2003). MA DEP mapped Cuttyhunk Pond in 1998 from field verified 1994 aerial photography. Total coverage of the pond from the 1998 survey was approximately 13% of the pond.







Too little data are available; therefore, the *Aquatic Life Use* is not assessed for Cuttyhunk Pond.

### Shellfish Harvesting

The DMF Shellfish Status Report of July 2000 indicates that area E9.2 (which contains 0.14 mi<sup>2</sup> of this segment) is conditionally approved and area E9.1 (0.01 mi<sup>2</sup>) is prohibited (DFWELE 2000).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is impaired for this entire segment.

Cuttyhunk Pond (MA97-21) Use Summary Table

Designated Uses	Aquatic Life	Fish Consumption	Shellfish Harvesting	Primary Contact	Secondary Contact	Aesthetics
						
Status	Not Assessed	Not Assessed	Impaired Cause (known): fecal coliform bacteria Source: unknown	Not Assessed		Not Assessed

### RECOMMENDATIONS FOR CUTTYHUNK POND (MA97-21):

- Review and implement as appropriate recommendations from DMF shellfish survey program reports.
- Continue to monitor eelgrass bed habitat and supplement with water quality parameters necessary to assess the *Aquatic Life Use* status of Cuttyhunk Pond.



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## LIST OF APPENDICES, TABLE AND FIGURES

### APPENDIX A - ISLANDS 2000 BIOLOGICAL ASSESSMENT

- Table 1. List of macroinvertebrate biomonitoring station locations sampled during the 2000 Islands biomonitoring survey, including station identification number, station description, and sampling date.
- Table 2. List of perceived problems addressed during the 2000 Islands biomonitoring survey. Specific sampling stations addressing each problem are also listed, as is the sampling methodology employed at each station.
- Table A1. Species-level taxa list and counts, functional feeding groups (FFG), and tolerance values (TV) for macroinvertebrates collected from stream sites during the Islands biomonitoring survey between 20 and 21 June 2000. Refer to Table 1 for a complete listing and description of sampling stations.
- Table A2. Summary of RBP III data analysis for macroinvertebrate communities sampled during the Islands biomonitoring survey between 20 and 21 June 2000. Shown are the calculated metric values, metric scores (in italics) based on comparability to the reference station (PB01), and the corresponding assessment designation for each biomonitoring station.
- Table A3. Habitat assessment summary for macroinvertebrate biomonitoring stations sampled during the 2000 Islands survey. For parameters #1-7, scores ranging from 16-20 = optimal; 11-15 = suboptimal; 6-10 = marginal; 0-5 = poor. For parameters #8-10, scores ranging from 9-10 = optimal; 6-8 = suboptimal; 3-5 = marginal; 0-2 = poor. Refer to Table 1 for a complete listing and description of sampling stations.
- Figure 1. Locations of DEP/DWM biomonitoring stations for the 2000 Islands survey

### APPENDIX B - 1995 AND 2000 MA DEP DWM FISH TOXICS MONITORING

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## APPENDIX A - ISLANDS 2000 BIOLOGICAL ASSESSMENT

Technical Memorandum TM-97-1

### ISLANDS (MARTHA'S VINEYARD) 2000 BIOLOGICAL ASSESSMENT

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## INTRODUCTION

Biological monitoring is a useful means of detecting anthropogenic impacts to the aquatic community. Resident biota (e.g., benthic macroinvertebrates, fish, periphyton) in a water body are natural monitors of environmental quality and can reveal the effects of episodic and cumulative pollution and habitat alteration (Barbour et al. 1995, Barbour et al. 1999). Biological surveys and assessments are the primary approaches to biomonitoring.

As part of the Massachusetts Department of Environmental Protection/Division of Watershed Management's (MA DEP/DWM) 2000 Islands assessments, aquatic benthic macroinvertebrate biomonitoring was conducted to evaluate the biological health of various drainage areas. Because groundwater dominates the hydrology on Nantucket and the Elizabeth Islands, The 2000 biomonitoring effort focused solely on the surface waters of Martha's Vineyard. In accordance with the *Quality Assurance Project Plan for 2000 Benthic Macroinvertebrate Biomonitoring* (Fiorentino 1999), a total of 4 biomonitoring stations were sampled to investigate the effects of nonpoint source (NPS) pollution stressors on resident aquatic communities. All stream segments were previously "unassessed" by DEP; thus, the biomonitoring effort will provide DEP/DWM with much needed baseline biological and habitat data that will aid future Islands assessments in determining if water quality and habitat conditions have improved or worsened over time.

To provide additional information necessary for making aquatic life use-support determinations required by Section 305(b) of the Clean Water Act, biomonitoring stations were compared to a regional reference (i.e., "least-impacted") station on Paint Mill Brook. Use of a regional reference station is particularly useful in assessing nonpoint source pollution (Hughes 1989), as well as nutrient and BOD loadings originating from multiple and/or unknown sources in a watershed. Ideally, the reference station is situated upstream from all known point sources of water pollution, and is assumed to be relatively unimpacted by nonpoint sources. Sampling locations, along with station identification numbers and dates, are noted in Table 1. Sampling locations are also shown in Figure 1. Table 2 includes a summary of some of the more important anthropogenic issues addressed during the 2000 Islands biomonitoring survey. These include a variety of nonpoint source perturbations that potentially threaten habitat, biological integrity, and water quality throughout Martha's Vineyard.

The main objectives of biomonitoring on Martha's Vineyard were: (a) to determine the biological health of selected streams within the drainage areas of Martha's Vineyard by conducting assessments based on aquatic macroinvertebrate communities; and (b) to identify impaired stream segments so that efforts can be focused on developing stormwater management and control of other nonpoint source pollution. Specific tasks were:

1. Conduct benthic macroinvertebrate sampling and habitat assessments at selected locations throughout Martha's Vineyard.
2. Based upon the macroinvertebrate data, identify river segments within the drainage areas of Martha's Vineyard with potential or existing nonpoint source pollution problems; and
3. Using the benthic macroinvertebrate data and supporting field/habitat data:
  - Assess the types of water quality problems that are present, and
  - if possible, make recommendations for remedial actions.
  - Provide macroinvertebrate and habitat data to DEP/DWM's Environmental Monitoring and Assessment Program for assessments of aquatic life use-support status required by Section 305(b) of the Federal Clean Water Act (CWA).
  - Provide macroinvertebrate and habitat data for other informational needs of Massachusetts regulatory agencies, as well as the Executive Office of Environmental Affairs (EOEA) Massachusetts Watershed Initiative (MWI) Islands Basin Team.



**Table 1.** List of macroinvertebrate biomonitoring station locations sampled during the 2000 Islands biomonitoring survey, including station identification number, station description, and sampling date.

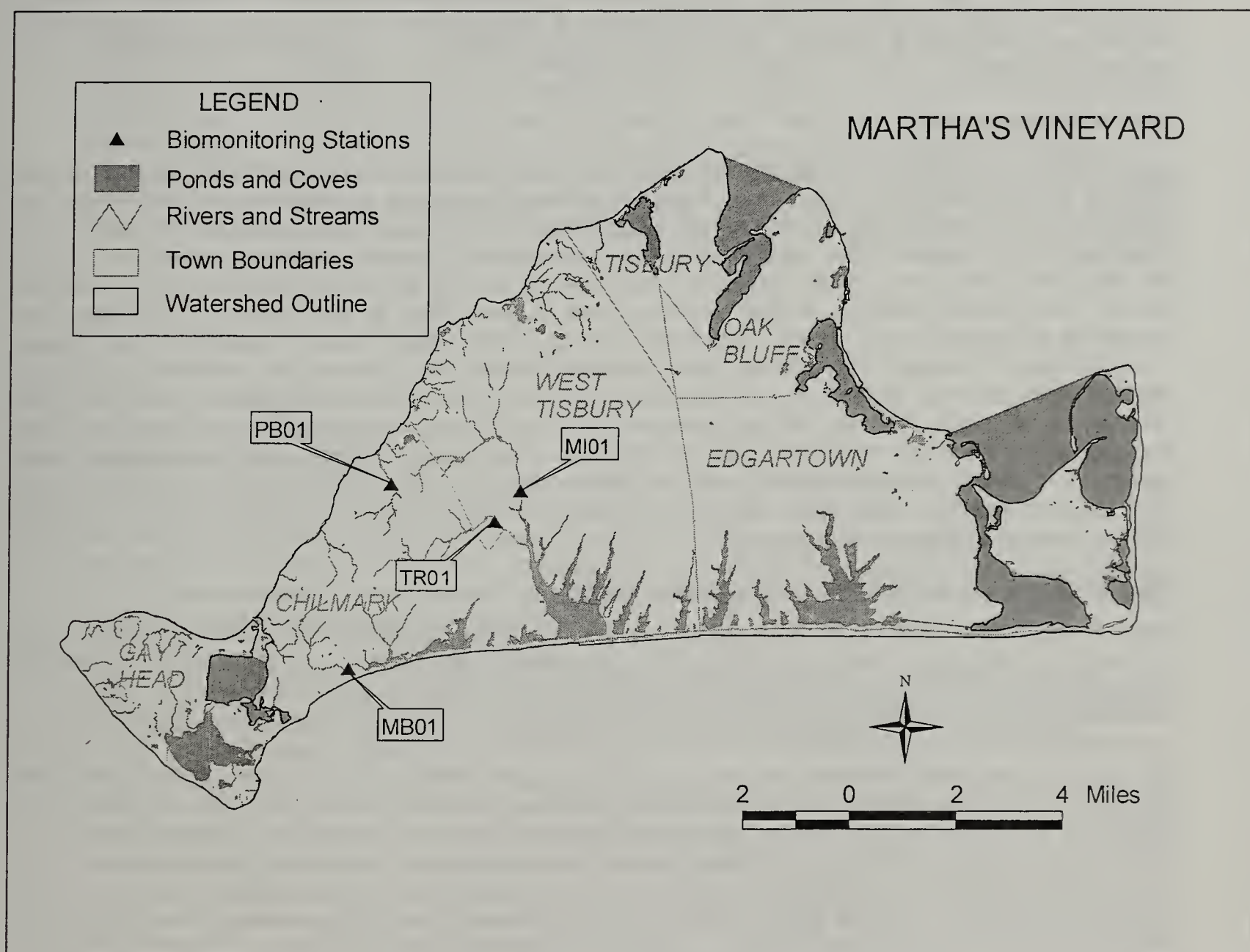
Station	Site Description	Sampling Date
PB01	Paint Mill Brook, mile point 0.60, 130 m downstream from North Road, Chilmark, MA	20 June 2000
MB01	Mill Brook, mile point 0.40, 800 m upstream from Chilmark Pond, near South Road, Chilmark, MA	20 June 2000
TR01	Tiasquam River, mile point 0.80, 110 m downstream from Tiasquam Lane, West Tisbury, MA	21 June 2000
MI01	Mill Brook, mile point 0.65, 110 m downstream from Panhandle Road, West Tisbury, MA	21 June 2000

**Table 2.** List of perceived problems addressed during the 2000 Islands biomonitoring survey. Specific sampling stations addressing each problem are also listed, as is the sampling methodology employed at each station.

Station	Issues/Problems	Sampling Method
PB01	"Unassessed" by DEP <sup>1</sup> ; Reference Condition	RBPIII-kick sampling
MB01	"Unassessed" by DEP <sup>1</sup> ; Miscellaneous NPS (e.g., road runoff); Receiving water (Chilmark Pond) 303d-listed for pathogens <sup>2</sup>	RBPIII-kick sampling
TR01	"Unassessed" by DEP <sup>1</sup> ; Miscellaneous NPS (agricultural and urban runoff); Receiving water (Tisbury Great Pond) 303d-listed for pathogens <sup>2</sup>	RBPIII-kick sampling
MI01	"Unassessed" by DEP <sup>1</sup> ; Miscellaneous NPS (agricultural and urban runoff); Receiving water (Tisbury Great Pond) 303d-listed for pathogens <sup>2</sup>	RBPIII-kick sampling

<sup>1</sup> (MA DEP 1997)

<sup>2</sup> (MA DEP 1999)



**Figure 1.** Locations of DEP/DWM biomonitoring stations for the 2000 Islands survey.



## METHODS

### ***Macroinvertebrate Sampling - RBP III***

The macroinvertebrate sampling and processing procedures employed during the 2000 Islands biomonitoring survey are described in the standard operating procedures (Nuzzo 1999), and are based on US EPA Rapid Bioassessment Protocols (RBPs) for wadeable streams and rivers (Barbour et al. 1999). Sampling was conducted by DEP/DWM biologists throughout a 100 m reach, in riffle/run areas with fast currents and rocky (cobble, pebble, and gravel) substrates—generally the most productive habitats, supporting the most diverse communities in the stream system. Ten kicks in squares approximately 0.46 m x 0.46 m were composited for a total sample area of about 2 m<sup>2</sup>. Samples were labeled and preserved in the field with denatured 95% ethanol, then brought to the DEP/DWM lab for further processing.

### ***Habitat Assessments***

An evaluation of physical and biological habitat quality is critical to any assessment of ecological integrity (Karr et al. 1986; Barbour et al. 1999). Habitat assessment supports understanding of the relationship between physical habitat quality and biological conditions, identifies obvious constraints on the attainable potential of a site, assists in the selection of appropriate sampling stations, and provides basic information for interpreting biosurvey results (US EPA 1995). Before leaving each sample reach during the 2000 Islands biomonitoring survey, habitat qualities were scored using a modification of the evaluation procedure in Barbour et al. (1999). The matrix used to assess habitat quality is based on key physical characteristics of the water body and the immediate riverfront area. Most parameters evaluated are instream physical attributes often related to overall land use and are potential sources of limitation to the aquatic biota (Barbour et al. 1999). The ten habitat parameters are as follows: instream cover, epifaunal substrate, embeddedness, sediment deposition, channel alteration, velocity/depth combinations, channel flow status, right and left (when facing downstream) bank vegetative protection, right and left bank stability, right and left bank riparian vegetative zone width. Habitat parameters are scored, totaled, and compared to a reference station to provide a final habitat ranking.

### ***Macroinvertebrate Sample Processing and Analysis***

Macroinvertebrate sample processing entailed distributing whole samples in pans, selecting grids within the pans at random, and sorting specimens from the other materials in the sample until approximately 100 organisms ( $\pm 10\%$ ) were extracted. Specimens were identified to genus or species as allowed by available keys, specimen condition, and specimen maturity. Taxonomic data were analyzed using a modification of Rapid Bioassessment Protocol III (RBP III) metrics and scores (Barbour et al. 1999). Based on the taxonomy various community, population, and functional parameters, or "metrics", were calculated which allow measurement of important aspects of the biological integrity of the community and change in a predictable way with increased anthropogenic influence (Karr et al. 1986; Barbour et al. 1995). This integrated approach provides more assurance of a valid assessment because a variety of biological parameters are evaluated. Deficiency of any one metric should not invalidate the entire approach (Barbour et al. 1999). Metric values for each station were scored based on comparability to the reference station, and scores were totaled. The percent comparability of total metric scores for each study site to those for a selected "least-impacted" reference station yields an impairment score for each site. RBP III analysis separates sites into four categories: non-impacted, slightly impacted, moderately impacted, and severely impacted. Each impact category corresponds to a specific aquatic life use-support determination used in the CWA Section 305(b) water quality reporting process—non-impacted and slightly impacted communities are assessed as "support" while moderately and severely impacted communities are assessed as "impaired". A detailed description of the *Aquatic Life* use designation is outlined in the *Massachusetts Surface Water Quality Standards* (MA DEP 1996). Impacts to the benthic community may be indicated by the absence of generally pollution-sensitive macroinvertebrate taxa such as Ephemeroptera, Plecoptera, and Trichoptera (EPT); dominance of a particular taxon, especially the pollution-tolerant Chironomidae and Oligochaeta taxa; low Taxa Richness; or shifts in community composition relative to the reference station (Barbour et al. 1999). Those biological metrics calculated and used in the analysis of Islands macroinvertebrate data are listed and defined below [For a more detailed description of metrics used to evaluate benthos data see Barbour et al. (1999)]:



1. Taxa Richness—a measure based on the number of taxa present. Generally increases with increasing water quality, habitat diversity, and habitat suitability. The lowest possible taxonomic level is assumed to be genus or species.
2. EPT Index—a count of the number of genera/species from the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). As a group these are considered three of the more sensitive aquatic insect orders. Therefore, the greater the contribution to total richness from these three orders, the healthier the community.
3. Biotic Index—Based on the Hilsenhoff Biotic Index (HBI), this is an index designed to produce a numerical value to indicate the level of organic pollution (Hilsenhoff 1982). Organisms have been assigned a value ranging from zero to ten based on their tolerance to organic pollution. Tolerance values currently used by DEP/DWM biologists were originally derived from Hilsenhoff and have since been revised by Bode et al. (1991). A value of zero indicates the taxon is highly intolerant of pollution and is likely to be found only in pollution-free waters. A value of ten indicates the taxon is tolerant of pollution and may be found in highly polluted waters. The number of organisms and the individually assigned values are used in a mathematical formula that describes the degree of organic pollution at the study site. The formula for calculating HBI is:

$$HBI = \frac{\sum x_i t_i}{n}$$

where

$x_i$  = number of individuals within a taxon

$t_i$  = tolerance value of a taxon

$n$  = total number of organisms in the sample

4. Ratio of EPT and Chironomidae Abundance—The EPT and Chironomidae abundance ratio uses relative abundance of these indicator groups as a measure of community balance. Skewed populations having a disproportionate number of the generally tolerant Chironomidae (“midges”) relative to the more sensitive insect groups may indicate environmental stress.
5. Percent Contribution Dominant Taxon—is the percent contribution of the numerically dominant taxon (genus or species) to the total numbers of organisms. A community dominated by few species indicates environmental stress. Conversely, more balance among species indicates a healthier community.
6. Ratio of Scraper and Filtering Collector Functional Feeding Groups—This ratio reflects the community food base. The proportion of the two feeding groups is important because predominance of a particular feeding type may indicate an unbalanced community responding to an overabundance of a particular food source (Barbour et al. 1999). Scrapers predominate when diatoms are the dominant food resource, and decrease in abundance when filamentous algae and mosses prevail. Filtering collectors thrive where filamentous algae and mosses are prevalent and fine particulate organic matter (FPOM) levels are high.
7. Community Similarity—is a comparison of a study site community to a reference site community. Similarity is often based on indices that compare community composition. Most Community Similarity indices stress richness or richness and abundance. Generally speaking, communities with comparable habitat will become more dissimilar as stress increases. In the case of the Islands bioassessments, an index of macroinvertebrate community composition was calculated based on similarity (i.e., affinity) to the reference community, expressed as percent composition of the following organism groups: Oligochaeta, Ephemeroptera, Plecoptera, Coleoptera, Trichoptera, Chironomidae, and Other. This approach was based on a modification of the Percent Model Affinity (Novak and Bode 1992). The reference site affinity (RSA) metric is calculated as:

$$100 - (\sum \delta \times 0.5)$$

where  $\delta$  is the difference between the reference percentage and the sample percentage for each taxonomic grouping. RSA percentages convert to RBPIII scores as follows: <35% receives 0 points; 2 points in the range from 35 to 49%; 4 points for 50 to 64%; and 6 points for  $\geq 65\%$ .



## RESULTS AND DISCUSSION

The macroinvertebrate and habitat data collected at each sampling station during the 2000 Islands biomonitoring survey are attached as an Appendix. Included in the taxa list (Table A1) are total organism counts, and the functional feeding group (FFG) and tolerance value (TV) of each taxon.

A summary table of the RBP III data analysis of the 2000 benthos data, including biological metric calculations, metric scores, and impairment designations, is included in the Appendix as well. Table A2 is the summary table for all Islands biomonitoring stations using PB01 as the regional reference station. Habitat assessment scores for all stations are also included in the data analysis summary table, while a more detailed summary of habitat parameters is found in Table A3.

The 2000 biomonitoring effort focused solely on the drainage areas of Martha's Vineyard. The benthic macroinvertebrate and habitat assessment data collected here indicate generally good water quality and overall biological health at most of the streams investigated; however, some degree of anthropogenic perturbation was observed at all of the biomonitoring study stations (MB01; TR01; MI01). Though not at gross levels, urban and/or agricultural runoff, habitat degradation, and other forms of nonpoint source pollution threaten water quality and biological integrity throughout much of the island. Water quality appeared excellent in Paint Mill Brook, as reflected in the healthy biological community encountered at the biomonitoring reference station (PB01).

### *Islands - Description*

The Islands drainage areas include the Elizabeth Islands as well as the Islands of Nantucket and Martha's Vineyard. Nantucket is an island of 49.5 square miles located in the Atlantic Ocean approximately 20 miles south of Cape Cod, Massachusetts. It is a combination of moraines and outwash plain resulting primarily from the last episode of glaciation that affected the Northeast about 15,000 years ago. The town, which is a county as well, has elevations to about 100 feet above sea level and approximately 94 miles of shoreline. The island was settled in 1641 with farming and sheep raising the principal occupations. Eventually, fishing and whaling became the dominant economic activity and by 1768, the town was homeport for over 125 whaling vessels. In the early 19th century, the manufacture of wool and nails became major activities. Nantucket's economy today is based primarily on tourism and construction activities. However, publishing, printing, and ship and boat building and repairing, and sand and gravel extraction are also part of the economic base.

Martha's Vineyard, located approximately 10 miles off the south coast of Cape Cod, is an island consisting of six towns: Chilmark, Edgartown, Aquinnah (formerly Gay Head), Oak Bluffs, Tisbury, and West Tisbury. Maximum elevation on the island is approximately 300 feet. There are approximately 125 miles of shoreline, ranging from nine in West Tisbury to 49 in Edgartown. The island, together with the Town of Gosnold (Elizabeth Islands) forms Dukes County. Gosnold has approximately 54 miles of tidal shoreline. The first settlement of Martha's Vineyard was in 1671. Trading, whaling—including the largest sperm-oil candle factory in the world—fishing, salt works, and agricultural activities were the economic base. Today, some farming, fishing, and pottery manufacturing remain; however, tourism is the major component of the economy.

The Elizabeth Islands, located near the southwest corner of Cape Cod, encompass 8,300 acres in a chain of fifteen islands all in the town of Gosnold, Dukes County. One family owns and manages all but two of the islands (Cuttyhunk and Penikese). Most of the islands are grassy with areas of low woods or shrub growth.

### *Islands - Water Resources*

On Martha's Vineyard and Nantucket, ponds are the dominant form of surface freshwater resources. The major freshwater resource overall is the groundwater which supplies all of the drinking water on the islands. The groundwater is also the receiving water body for effluent from the existing municipal wastewater treatment facilities (Edgartown and Nantucket) as well as all the individual subsurface systems on both islands. In addition to freshwater, both islands have extensive marine and brackish water resources. Activities range from boating and swimming to shellfish harvesting.



**PB01**—Paint Mill Brook, mile point 0.60, 130 m downstream from North Road, Chilmark, MA

#### *Habitat*

The PB01 biomonitoring station began approximately 130 m downstream from North Road in a forested and relatively undeveloped portion of Chilmark. The mostly (85%) shaded sampling reach meandered through an area of dense, mainly deciduous woodland. The stream was approximately 4 m wide, with a depth of about 0.15 m in the riffle areas and 0.50 m in the deepest pool areas. Water filled >75% of the available channel, leaving only small isolated areas of exposed substrates. An abundance of rocky substrates (cobble, pebble, and gravel) provided excellent epifaunal habitat for macroinvertebrates. Dense instream moss cover provided additional benthos habitat. Fish habitat was also considered excellent, with snags and boulders providing a good mix of stable cover. Riparian/bank habitat parameters scored well—banks were well-vegetated with grasses and shrubby (especially sweet pepperbush, *Clethra* sp.) vegetation. Bank stability was generally good, and the riparian vegetative zone extended undisturbed from both banks. Isolated sand deposits were observed throughout the reach; however, origins of these inputs were unknown. Instream deposition may be a result of the upstream road crossing or simply the sandy nature of soils on Martha's Vineyard.

PB01 received a total habitat assessment score of 163/200—the highest received by a biomonitoring station during the 2000 Islands survey (Table A3). This was the designated reference station for the 2000 biosurveys by virtue of its habitat evaluation, presumed good water quality, and minimal upstream or adjacent land use impacts (i.e., absence of point source inputs, lack of channelization, minimal development or agricultural activity nearby, undisturbed and well-vegetated riparian zone, minimal nonpoint source pollution inputs).

#### *Benthos*

The Paint Mill Brook biomonitoring station was characterized by a macroinvertebrate assemblage indicating a healthy aquatic community, with metric values indicative of clean water and “least-impacted” conditions (Table A2). In particular, those attributes that measure components of community structure (i.e., Taxa Richness, Biotic Index, EPT Index)—which display the lowest inherent variability among the RBP metrics used (Resh 1988)—scored well, further corroborating the designation as a reference station. An extremely low Biotic Index (3.63—the lowest of all the Islands biomonitoring stations), and high EPT Index and Scraper/Filterer metric values relative to other biomonitoring stations in the survey indicated the dominance of pollution-sensitive taxa among the PB01 benthos assemblage, and good overall trophic balance. Only the Percent Dominant Taxon metric suffered point reductions (score= 4); however, this was the result of high densities of the stonefly, *Leuctra* sp. (Table A1)—a highly intolerant (TV= 0) taxon that requires high quality, well-oxygenated waters. The PB01 benthic community received a total metric score of 40 out of a possible score of 42 (Table A2).

**MB01**—Mill Brook, mile point 0.40, 800 m upstream from Chilmark Pond, near South Road, Chilmark, MA

#### *Habitat*

The MB01 biomonitoring station was approximately 800 m upstream and west of Chilmark Pond near the southwestern corner of the island. The sampling reach was accessed via the backyard of a private residence off of South Road in Chilmark. The mostly (70%) shaded reach began at a small footbridge and extended to an unpaved road leading to South Road. Stream width was approximately 4 m, with numerous shallow (0.10 m) riffle areas and occasional shallow (0.20 m) and deep (0.50 m) pools. Channel flow status was optimal, with water reaching the base of both banks and only minimal amounts of exposed substrates. Riffles contained an abundance of cobble/pebble substrates that provided macroinvertebrates with excellent epifaunal habitat. Fish habitat was also excellent, especially where snags and woody materials provided stable cover in the deeper pool areas. Instream vegetation was minimal and consisted mainly of aquatic mosses on cobble substrates. Filamentous and thin layers of green algae covered cobble/pebble substrates in about 20% (areal coverage) of the reach. Sweet pepperbush (*Clethra* sp.) grew undisturbed along the stable south bank before giving way to a mostly forested (evergreen/deciduous mix) riparian zone. The north bank was only minimally buffered from the sprawling lawns of the adjacent residence, however, and about 30% of the bank in the reach showed signs of erosion.



Potential nonpoint source pollution in the immediate area existed in the form of runoff from upstream road crossings, as well as the adjacent and minimally buffered lawns. Sand deposits were observed throughout the sampling reach—affecting almost 30% of the stream bottom and resulting in moderate substrate embeddedness; however, origins of sediment inputs were unknown.

MB01 received a total habitat assessment score of 146/200—the lowest received by a biomonitoring station in the 2000 Islands survey (Table A3).

### *Benthos*

Despite habitat constraints related to riparian disturbance and instream sediment deposition, RBP analysis of the MB01 benthic community resulted in a “non-impacted” assessment for biological condition (Table A2). The MB01 macroinvertebrate assemblage received a total metric score of 38, representing 95% comparability to the reference station at Paint Mill Brook. Only two metric values led to scoring reductions, the result of a slight decline in EPT richness and a Community Similarity of 61%. However, metric values for EPT/Chironomidae, Scraper/Filterers, and Percent Dominant Taxon actually outperformed those for the reference station (and all other study stations) and are indicative of a well-balanced benthic community exhibiting good trophic structure. As with the reference station at PB01, the MB01 benthos assemblage contained two species (*Leuctra* sp.; *Amphinemura* sp.) of highly intolerant Plecoptera larvae in addition to other pollution sensitive taxa (Table A1).

**TR01**—Tiasquam River, mile point 0.80, 110 m downstream from Tiasquam Lane, West Tisbury, MA

### *Habitat*

TR01 began immediately upstream from Looks Pond and approximately 110 m downstream from Tiasquam Lane near West Tisbury center. Landuse in the immediate area was a combination of residential development (single-family home adjacent to sampling reach), agriculture, and undeveloped forest. Stream width was approximately 4.5 m, with depths ranging from 0.10 m in the riffles to 0.50 m in the deepest run/pool areas. Channel flow status was optimal, with water reaching the base of both banks and leaving virtually no exposed substrates. Riffle areas were somewhat limited in the mostly (70%) shaded, run-dominated reach, providing adequate but less than optimal habitat for macroinvertebrates. Fish habitat was also slightly less than optimal, with occasional boulders providing the majority of the cover. Instream vegetation and algal cover were fairly minimal, with burreed (*Sparganium* sp.) and pondweed (*Potamogeton* sp.) the dominant rooted macrophytes and free-floating filamentous green algae in the pools. Banks were stable and well-vegetated with mosses and shrubby (*Clethra* sp.) growth along the west bank before giving way to a forested riparian zone; however, the maintenance of an expansive lawn along the east bank resulted in bank instability (i.e., erosion) and virtually no riparian vegetation.

Nonpoint source threats included the adjacent and poorly buffered lawn and the upstream road crossing. Minimally buffered agricultural activities and small impoundments located upstream from the sampling reach may contribute to the FPOM deposits and instream turbidity observed at TR01.

TR01 received a total habitat assessment score of 157/200 (Table A3). Substrate embeddedness—due to both organic (FPOM) and inorganic (sand) deposition—and riparian disruption along the east bank were the most negatively affected habitat parameters.

### *Benthos*

The TR01 benthos assemblage received a total metric score of 28, representing 70% comparability to PB01 (Table A2). The displacement of pollution sensitive taxa such as EPTs with more tolerant forms such as Chironomidae led to the resulting “slightly impacted” bioassessment. In addition, the TR01 macroinvertebrate community was highly dissimilar (Community Similarity= 45%) to the reference community at PB01. The presence of numerous chironomids, as well as filter-feeding taxa such as net-spinning caddisflies (e.g., *Hydropsyche* sp.; *Chimarra* sp.), may be indicative of organic enrichment in this portion of Tiasquam River. Significant deposits of FPOM throughout the sampling reach corroborate the effects of enrichments at TR01. FPOM is not the only important food resource here, however, as the presence of numerous algae-grazing (i.e., periphyton scrapers) elmids (e.g., *Stenelmis* sp.) and a high-scoring Scraper/Filterer metric value suggest trophic structure remains balanced among the TR01 benthic community.



**MI01**—Mill Brook, mile point 0.65, 110 m downstream from Panhandle Road, West Tisbury, MA

### *Habitat*

The MI01 sampling reach was located upstream from Old Millpond and began approximately 110 m downstream from Panhandle Road near West Tisbury center. The mostly (70%) shaded reach was approximately 3 m wide, with a depth of 0.20 - 0.40 m in the riffle/run areas and 0.60 m in the deepest pools. Channel flow status was optimal, with water reaching the base of both banks and leaving virtually no exposed substrates. Gravel and cobble substrates in the run areas and a few isolated riffles offer good epifaunal habitat for macroinvertebrates. Dense instream moss growth on cobble substrates provided additional benthic microhabitat. Fish habitat was optimal, with scattered boulders, snags, and overhanging vegetation providing good cover throughout the reach. Bank and riparian habitat parameters scored well—both stream banks were well-vegetated and stabilized with a dense arrowwood (*Viburnum* sp.)-dominated shrub layer and herbaceous (jewelweed, *Impatiens capensis*; ferns; morning glory, *Convolvulus* sp.) growth before giving way to an undisturbed riparian zone of mainly deciduous forest. Aquatic vegetation existed mainly in the form of instream mosses, although rooted macrophytes (burreed, *Sparganium* sp.; water starwort, *Callitriche* sp.; pondweed, *Potamogeton* sp.) were observed as well. Algal cover was minimal and consisted of filamentous green algae on some rock and woody substrates.

It was unclear as to the origins of instream deposits of FPOM and sand, as well as observed turbidity in the MI01 reach. The upstream road crossing is one potential source of nonpoint pollution. Landuse in this portion of Martha's Vineyard, particularly upstream from MI01, is predominantly light residential and agricultural—numerous small, independently-owned farms are situated adjacent to Mill Brook or one of its many impounded areas. In addition, a sand/gravel pit is located near the stream and just upstream from MI01 in the vicinity of North Tisbury, although mining operations here may be inactive (M. Weinstein, MA DEP/DWM, personal communication).

MI01 received a total habitat assessment score of 162/200, which was highly comparable to habitat quality at the PB01 reference station (Table A3). Habitat scores for sediment deposition, and associated substrate embeddedness, affected the overall evaluation most negatively.

### *Benthos*

The MI01 benthos assemblage received a total metric score of 22—the lowest of any of the biomonitoring stations in the survey and representing only 55% comparability to the reference community at PB01 (Table A2). The resulting assessment, "slightly impacted", fell into the lowest end of that biological condition category (slightly impacted= 54% - 79% comparable to reference). That overall habitat quality at MI01 was comparable to reference conditions suggests that water quality limits biological potential in this portion of Mill Brook. These water quality effects may also contribute to the 303d-listing of Mill Brook's receiving water, Tisbury Great Pond, which is impaired due to pathogens (MA DEP 1999).

The macroinvertebrate community at MI01 exhibited some of the poorest performing metrics in the entire survey—namely Biotic Index, EPT Index, EPT/Chironomidae, Scrapers/Filterers, and Community Similarity (Table A2). Scores for EPT/Chironomidae and EPT Index metrics were particularly low (score= 0) here, indicating that pollution sensitive forms of EPT taxa have been displaced by chironomids—generally considered more tolerant of conventional organic pollutants. Indeed, chironomids comprised 44% of the benthos sample at MI01. More significant, however, was the numerical dominance of the midge *Tvetenia* spp. (Table A1)—a genus whose presence is commonly associated with nutrient-enriched streams that receive agricultural runoff (Bode and Novak 1998). High densities of filter-feeding caddisflies—especially *Chimarra* sp. (Table A1)—corroborate the effects of organic enrichment in this portion of Mill Brook.



## SUMMARY AND RECOMMENDATIONS

### PB01 Paint Mill Brook

**Benthos:** Reference condition

**Habitat:** Reference condition

The PB01 benthic community was thought to represent the “best attainable” conditions on Martha’s Vineyard with respect to biological integrity, habitat quality, and water quality. As the reference condition, biomonitoring is recommended here during the next DEP Islands survey in 2004. Fish population sampling, which has not historically been performed by DEP in the Islands, should accompany the macroinvertebrate sampling effort. In addition, water quality monitoring here would help to establish baseline conditions while supplementing the biological data.

Because substrate is believed to be the most important factor regulating macroinvertebrate distribution and abundance (Minshall 1984), instream deposition and associated substrate embeddedness—though not severe and possibly the result of naturally sandy soils—may threaten aquatic habitat and biological integrity at PB01. The possibility of the North Road crossing as a source of sediment inputs should be investigated, as should the need for best management practices (BMPs) that may help to minimize the effects of road runoff in this portion of Paint Mill Brook.

### MB01 Mill Brook

**Benthos:** “Non-impacted” compared to reference

**Habitat:** 90% comparable to reference

Despite the healthy aquatic community observed here, habitat degradation—though not severe—is a concern. The greatest threat to the resident benthic community at MB01 may be instream sediments. Sand and other fine sediments drastically reduce benthic microhabitat quantity and/or quality by filling the interstitial spaces of epifaunal substrates, negatively affecting the structure and function of resident macroinvertebrate communities (Minshall 1984; Zweig and Rabeni 2001). In addition, the filling of pools with sediment reduces fish cover and may be detrimental to fish egg incubation and survival. While it may be difficult to eliminate or isolate all sources of sedimentation and other forms of runoff (stormwater, road/lawn runoff, riparian disturbances) that threaten habitat and biological quality at MB01, streambank stabilization and restoration of an adequate riparian buffer may help to alleviate the effects of some nonpoint source inputs to this portion of the river. Despite the naturally sandy nature of soils on Martha’s Vineyard, other sources may also contribute to the sediment deposits and associated substrate embeddedness observed throughout the MB01 sampling reach. A sand/gravel pit (possibly inactive) exists just upstream, located on South Road in the vicinity of Chilmark center. A site visit to determine the extent that this facility may contribute sediment loads to this portion of Mill Brook and the potential need for BMPs is suggested.

Biomonitoring (macroinvertebrates and fish) is recommended here during the next DEP Islands survey in 2004. In addition, water quality monitoring throughout the Mill Brook subwatershed—especially bacteria sampling—may help to isolate sources of bacteria responsible for the 303d-listing (for pathogens) of Mill Brook’s receiving water, Chilmark Pond.

### TR01 Tiasquam River

**Benthos:** “Slightly impacted” compared to reference

**Habitat:** 96% comparable to reference

Instream deposits and suspended forms of FPOM observed in the TR01 sampling reach may threaten biological potential the most. These fine materials can be deleterious because they can reduce light penetration (and consequently plant growth), smother hard surfaces, and fill interstices within the



substrate (Wiederholm 1984). Resident biota at TR01, then, may be subsequently affected by obstructions to food collection or respiration caused by fine deposits of organic/inorganic matter. Streambank stabilization and restoration of an adequate riparian buffer along the left bank may help to reduce potential nonpoint source inputs to this portion of the river.

Biomonitoring (macroinvertebrates and fish) is recommended here during the next DEP Islands survey in 2004. In addition, water quality monitoring throughout the Tiasquam River subwatershed—especially bacteria and nutrient sampling—may help to isolate sources (e.g., agricultural runoff) of nutrient/organic loads to the Tiasquam River and pathogens in Tisbury Great Pond.

#### **MI01 Mill Brook**

**Benthos:** "Slightly impacted" compared to reference

**Habitat:** 99% comparable to reference

Suspect water quality appears most responsible for biological impairment at MI01, where the benthic community reflects the effects of organic enrichment—most likely the result of nutrient loadings to the upstream impoundments and elsewhere along Mill Brook. Nutrient/organic loadings originating from various forms of runoff—most notably agricultural—probably contribute to the productive conditions in this portion of Mill Brook and the abundant FPOM (both suspended and deposited) food resource found at MI01.

Instream deposits of sand and FPOM threaten habitat quality and biological potential here as well. The reduction in EPT taxa and low EPT/Chironomidae densities among the MI01 assemblage may be at least partially attributed to sediment deposition and associated substrate embeddedness—two habitat parameters with the lowest combined score of all the Island biomonitoring stations (Table A3). A recent study by Zweig and Rabeni (2001) found EPT density and EPT richness to be significantly negatively correlated with deposited sediment across all their biomonitoring study sites, and EPT/Chironomidae density to be significantly negatively correlated at half their study sites.

Biomonitoring (macroinvertebrates and fish) is recommended here during the next DEP Islands survey in 2004. In addition, water quality monitoring throughout the Mill Brook subwatershed—especially nutrient and bacteria sampling—may help to isolated sources of nutrient/organic loads to Mill Brook and pathogens in Tisbury Great Pond. Outreach on nonpoint source pollution associated with agricultural practices (e.g., fertilizers and other runoff, bank erosion) is warranted, especially for those farms minimally buffered from the stream.

#### **Candidate Streams for Future Biomonitoring**

In addition to those streams mentioned above, DEP/DWM should consider conducting future (2004) biological monitoring (fish and macroinvertebrates) in the following streams—all located on Martha's Vineyard: Black Brook, Fulling Mill Brook, Roaring Brook, Blackwater Brook, and Smith Brook. All candidate streams appear (based on USGS topographic map examinations) to offer adequate gradient and lotic habitats conducive to aquatic benthic macroinvertebrate colonization and suitable for the application of DEP/DWM's sampling methodology. These relatively undisturbed subwatersheds are currently "unassessed" by DEP. Establishing baseline biological conditions here is recommended, especially given the current rate of new home construction and other potentially disruptive landuse development in this portion of the Islands. Smith and Blackwater brooks may presently be most-susceptible to potential nonpoint source pollution inputs—mainly the result of active cranberry cultivation in their drainage areas. In addition, Menemsha Pond and Chilmark Pond—receiving waters for Black Brook and Fulling Mill Brook respectively—are 303d-listed for pathogens (MA DEP 1999), warranting biological investigations and water quality (i.e., fecal coliform bacteria) monitoring in their headwater streams.



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## APPENDIX

### Macroinvertebrate taxa list, RBPIII analysis, and Habitat evaluations

Table A1. Species-level taxa list and counts, functional feeding groups (FFG), and tolerance values (TV) for macroinvertebrates collected from stream sites during the Islands biomonitoring survey between 20 and 21 June 2000. Refer to Table 1 for a complete listing and description of sampling stations.

TAXON	FFG <sup>1</sup>	TV <sup>2</sup>	MB01	MI01	PB01	TR01
Hydrobiidae	SC	8		1		
<i>Pisidium</i> sp.	FC	6		3		
Enchytraeidae	GC	10			1	
<i>Nais behningi</i>	GC	6		1		
<i>Nais communis</i>	GC	8		1		
<i>Nais variabilis</i>	GC	10				1
<i>Pristinella osborni</i>	GC	10			2	
Tubificidae (immature)	GC	10		1		1
<i>Lumbriculus variegatus</i>	GC	5	1		9	
<i>Stylodrilus heringianus</i>	GC	8	4		2	
<i>Caecidotea communis</i>	GC	8			11	1
<i>Gammarus</i> sp.	GC	6				3
Hydrachnidia	PR	6		1	2	
Baetidae	GC	4			1	
Baetidae (with cerci only)	GC	6	16	2	1	
Baetidae (with subequal terminal filaments)	GC	6				1
<i>Eurylophella</i> sp.	GC	2			3	
<i>Stenonema</i> sp.	SC	3		2		2
Leptophlebiidae	GC	2				1
<i>Boyeria</i> sp.	PR	2	1			
<i>Leuctra</i> sp.	SH	0	9		28	1
<i>Amphinemura</i> sp.	SH	1	1		1	
<i>Glossosoma</i> sp.	SC	0	4			
<i>Cheumatopsyche</i> sp.	FC	5		1		
<i>Diplectrona</i> sp.	FC	0	1		1	
<i>Hydropsyche betteni</i>	FC	6	8	3		14
<i>Hydroptila</i> sp.	GC	6			2	
<i>Lepidostoma</i> sp.	SH	1	2			
<i>Oecetis</i> sp.	PR	5				1
Apataniidae	SC	3			10	
<i>Psilotreta</i> sp.	SC	0			2	
<i>Chimarra</i> sp.	FC	4		26		21
<i>Optioservus ovalis</i>	SC	4	15			
<i>Oulimnius latiusculus</i>	SC	4				3
<i>Promoresia</i> sp.	SC	2	8			5
<i>Promoresia tardella</i>	SC	2		1		
<i>Stenelmis</i> sp.	SC	5	2	14	3	18



Table A1 (con't.)

TAXON	FFG <sup>1</sup>	TV <sup>2</sup>	MB01	MI01	PB01	TR01
<i>Anchytarsus</i> sp.	SH	4	6			
<i>Probezzia</i> sp.	PR	6		1		
<i>Polypedilum aviceps</i>	SH	4		9		3
<i>Polypedilum flavum</i>	SH	6		3		
<i>Micropsectra</i> sp.	GC	7		1		
<i>Stempellinella</i> sp.	GC	2				1
<i>Diamesa</i> sp.	GC	5	1			1
<i>Cardiocladius</i> sp.	PR	5		1		
<i>Cricotopus vierriensis</i>	SH	7				1
<i>Cricotopus/Orthocladius</i> sp.	GC	7		1	1	1
<i>Eukiefferiella devonica</i> gr.	GC	4			5	
<i>Parametrioctenus</i> sp.	GC	5		7		
<i>Tvetenia bavarica</i> gr.	GC	5	4	21	1	9
<i>Tvetenia vitracies</i> gr.	GC	5		1		
<i>Conchapelopia</i> sp.	PR	6			1	
<i>Thienemannimyia</i> sp.	PR	6		2		
<i>Simulium</i> sp.	FC	5	14		10	6
<i>Simulium tuberosum</i> complex	FC	4	1		3	1
<i>Dicranota</i> sp.	PR	3	3		4	1
TOTAL			101	104	104	97

<sup>1</sup> Functional Feeding Group (FG) lists the primary feeding habit of each species and follows the abbreviations: SH-Shredder; GC-Gathering Collector; FC-Filtering Collector; SC-Scraper; PR-Predator.

<sup>2</sup> Tolerance Value (TV) is an assigned value used in the calculation of the biotic index. Tolerance values range from 0 for organisms very intolerant of organic wastes to 10 for organisms which are very tolerant.



Table A2. Summary of RBP III data analysis for macroinvertebrate communities sampled during the Islands biomonitoring survey between 20 and 21 June 2000. Shown are the calculated metric values, metric scores (in italics) based on comparability to the reference station (PB01), and the corresponding assessment designation for each biomonitoring station.

STATION	PB01		MB01		TR01		MI01	
STREAM	Paint Mill Brook		Mill Brook		Tiasquam River		Mill Brook	
HABITAT SCORE	163		146		157		162	
TAXA RICHNESS	21	6	18	6	21	6	23	0
BIOTIC INDEX	3.63	6	4.09	6	4.74	4	4.89	4
EPT INDEX	8	6	7	4	7	4	5	0
EPT/CHIRONOMIDAE	6.13	6	8.20	6	2.56	2	0.74	0
SCRAPERS/FILTERERS	1.07	6	1.21	6	0.67	6	0.55	0
% DOMINANT TAXON	27%	4	16%	6	22%	4	25%	4
COMMUNITY SIMILARITY (REFERENCE AFFINITY)	100%	6	61%	4	45%	2	38%	2
TOTAL METRIC SCORE	40		38		28		22	
% COMPARABILITY TO REFERENCE STATION	100%		95%		70%		55%	
BIOLOGICAL CONDITION (DEGREE IMPAIRMENT)	REFERENCE		NON-IMPACTED		SLIGHTLY IMPACTED		SLIGHTLY IMPACTED	

Table A3. Habitat assessment summary for macroinvertebrate biomonitoring stations sampled during the 2000 Islands survey. For parameters #1-7, scores ranging from 16-20 = optimal; 11-15 = suboptimal; 6-10 = marginal; 0-5 = poor. For parameters #8-10, scores ranging from 9-10 = optimal; 6-8 = suboptimal; 3-5 = marginal; 0-2 = poor. Refer to Table 1 for a complete listing and description of sampling stations.

Habitat Assessment	PB01*	MB01	TR01	MI01
<b>INSTREAM PARAMETERS (Range is 0-20)</b>				
INSTREAM COVER	15	17	15	16
EPIFAUNAL SUBSTRATE	17	18	16	18
EMBEDDEDNESS	20	17	14	11
CHANNEL ALTERATION	20	18	13	18
SEDIMENT DEPOSITION	13	14	15	12
VELOCITY-DEPTH COMBINATIONS	13	14	14	11
CHANNEL FLOW STATUS	17	16	15	19
<b>BANK/RIPARIAN PARAMETERS (Range is 0-10 for each bank)</b>				
BANK VEGETATIVE PROTECTION	10 10	5 8	2 10	10 10
BANK STABILITY	8 8	6 9	6 10	10 10
RIPARIAN VEGETATIVE ZONE WIDTH	10 10	2 7	2 10	10 10
<b>TOTAL SCORE</b>	<b>163*</b>	<b>146</b>	<b>157</b>	<b>162</b>

\*reference condition



## APPENDIX B - 1995 and 2000 MA DEP DWM FISH TOXICS MONITORING

### INTRODUCTION

Fish toxics monitoring is a cooperative effort between the Massachusetts Department of Public Health (MDPH), the Massachusetts Department of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE), and three Massachusetts Department of Environmental Protection (MA DEP) Offices/Divisions: Division of Watershed Management (DWM), Office of Research and Standards (ORS), and the Division of Environmental Analysis (DEA).

In October 1995 fish toxics monitoring was conducted by MA DEP DWM personnel at three ponds on Nantucket: Gibb's Pond, Long Pond, and Miacomet Pond, and at three ponds on Martha's Vineyard: Long Cove Pond (West Tisbury), Seths Pond (West Tisbury), and Upper Lagoon Pond (Oak Bluffs/Tisbury).

In September 2000 fish toxics monitoring was conducted by MA DEP DWM personnel at three ponds on Nantucket: Head of Hummock Pond, Tom Nevers Pond, and Washing Pond, and in June 2000 at Duarte Pond, Oak Bluffs on Martha's Vineyard.

### PROJECT OBJECTIVES

Fish tissue monitoring is typically conducted to assess the concentrations of toxic contaminants in freshwater fish, identify waterbodies where those concentrations may impact human health, and identify waters where toxic chemicals may impact fish and other aquatic life. Nonetheless, human health concerns have received higher priority and, therefore, fish tissue analysis has been restricted to edible fillets. Fish toxics monitoring was designed to screen the edible fillets of several species of fish representing different feeding groups (i.e., bottom dwelling omnivores, top-level predators, etc.) for the presence of heavy metals (As, Cd, Hg, Pb, Se), polychlorinated biphenyls (PCBs) and pesticides. These data are then used by the Massachusetts Department of Public Health in assessing human health risks associated with the consumption of freshwater fishes. In 2000, MA DEP DWM fish toxics monitoring was conducted under a quality assurance project plan (QAPP), *2000 Fish Toxics QAPP* (CN037.0). Data quality objectives are presented in this plan and there were no deviations from the QAPP.

### METHODS

#### ***Field methods***

In 1995 and 2000 uniform protocols, designed to assure accuracy and prevent cross-contamination of samples, were followed for collecting, processing and shipping fish. The characteristics of each site determine the method(s) of sample collection. All ponds on Nantucket were sampled using gill nets and all ponds on Martha's Vineyard were sampled by electrofishing and gill netting. Electrofishing is performed by maneuvering a shock boat through the littoral zone and shallow water habitat of the waterbody and collecting stunned fish. Alternatively, gill nets are set in various locations and checked every two hours.

Fish collected were stored in a live well filled with site water until the completion of sampling. After removal from the live well, all fish to be analyzed were stored on ice prior to sample preparation. Live fish, which were not included as part of the sample, were released. Where possible, fish selected for analysis represented species and sizes desired by the angling public for consumption, as well as from different feeding guilds (i.e., top level predator, invertivore, omnivore). Lengths and weights were measured and fish were visually inspected for tumors, lesions, or other indications of stress or disease. Fish included in the sample were processed in the field. Scale samples or pectoral fin spines were obtained from each fish to determine the approximately age of the fish. Fish were filleted (skin off) on glass cutting boards and prepared for freezing. All equipment used in the filleting process was rinsed with water to remove slime, scales, and other fluids such as blood, and then re-rinsed in deionized water before (and/or after) each sample. Composite fillet samples targeted for metals analysis were placed in VWR 32-ounce high-density polyethylene (HDPE) cups with covers. The opposite fillets were wrapped in aluminum foil for % lipid, PCB and organochlorine pesticide analyses. Samples were tagged and frozen



for subsequent delivery to MA DEP's Wall Experiment Station (WES). Additional details related to the collection, handling, and processing of samples in 2000 are presented in DWM's report entitled *2000 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys*.

#### **Laboratory methods**

In 1995 methods used at WES for analyzing metals include the cold vapor method using a VGA hydride generator for mercury. Varian 1475 flame atomic absorption was used for all remaining metals (arsenic, cadmium, lead, and selenium). PCB/organochlorine pesticides analyses were performed on a gas chromatograph equipped with an electron capture detector (MA DEP January 1995). Additional information on analytical techniques used at WES is available from the laboratory.

In 2000 methods used at WES for analyzing metals include the cold vapor method using a Perkin Elmer, FIMS (Flow Injection Mercury System), which uses Flow Injection Atomic Absorption Spectroscopy for mercury (Maietta and Colonna-Romano 2000). Cadmium and lead were analyzed using a Perkin Elmer, Optima 3000 XL ICP – Optical Emission Spectrophotometer. Arsenic and selenium were analyzed using a Perkin Elmer, Zeeman 5100 PC, Platform Graphite Furnace. PCB/organochlorine pesticide analysis was performed on a gas chromatograph equipped with an electron capture detector. Additional information on analytical techniques used at WES is available from the laboratory.

### **RESULTS**

The results of MA DEP 1995 and 2000 Islands Watershed fish toxics monitoring surveys are described below for each sampling event (MA DEP 1995 and Maietta and Colonna-Romano 2000). Data for all surveys is presented in Tables B1 and B2 and sampling locations are depicted in Figure B1. All raw data files, field sheets, lab reports, chain of custody forms, and other metadata are maintained in databases at the MA DEP DWM office in Worcester, MA. Quality Assurance Data is available in *Data Validation Report for Year 2000 Project Data* (draft) (CN 083.0).

Fish toxics monitoring in the Islands Watershed in 1995 and 2000 resulted in site-specific fish consumption advisories for three of the waterbodies on Nantucket because of elevated levels of mercury: Gibbs Pond, Miacomet Pond, and Tom Nevers Pond (MDPH 2002a).

In addition to the site-specific advisories, MDPH recommended that additional fish tissue sampling be conducted at Upper Lagoon Pond, Long Cove Pond, and Seths Pond to better evaluate the need for an advisory. MDPH also recommends additional sampling at Gibbs Pond in order to provide data for an updating of the advisory status previously issued.

#### **1995 Results**

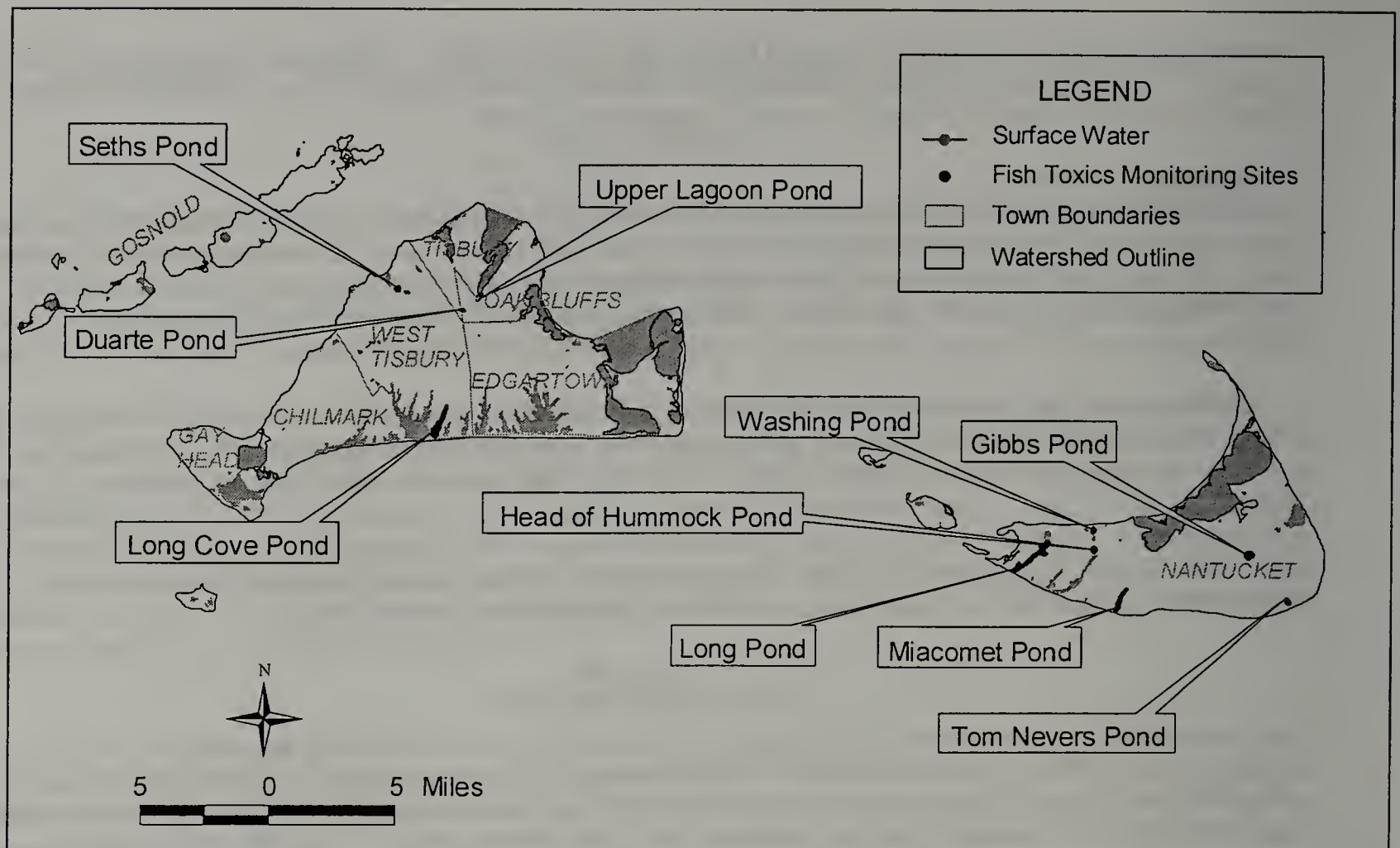
##### **Gibbs Pond (MA97028), Nantucket**

Fish collected from Gibbs Pond on 25/26 October via gill netting included chain pickerel, white and yellow perch. Individual chain pickerel, yellow perch, and white perch samples and a five-fillet composite of white perch were analyzed for cadmium, lead, mercury, arsenic, selenium, percent lipids, PCB arochlors and congeners, and pesticides.

Mercury concentrations in fish tissue ranged from 0.090 to 0.828 mg/kg wet weight. Selenium levels ranged from 0.186 to 0.389 mg/kg wet weight. Arsenic concentrations ranged from below detection to 0.109 mg/kg wet weight. PCB arochlors and congeners, pesticides, cadmium, and lead were not detected in the edible fillets of all samples analyzed from Gibbs Pond. A site-specific advisory against the consumption of fish from Gibbs Pond was issued by MDPH because of elevated mercury concentrations.

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Gibbs Pond."
2. "The general public should limit consumption of all fish from Gibbs Pond to two meals per month."





**Figure B1.** 1995 and 2000 MA DEP DWM fish toxics monitoring sites

#### **Long Pond (MA97050), Nantucket**

Gill netting on 24 October 1995 on Long Pond resulted in the collection of white perch and yellow perch. Two three-fillet composite samples of white perch and two three-fillet composite samples yellow perch were analyzed for cadmium, lead, mercury, arsenic, selenium, percent lipids, PCB arochlors and congeners, and pesticides.

Mercury levels were below the MDPH "trigger level" of 0.50 mg/kg wet weight and ranged from 0.068 to 0.387 mg/kg wet weight. Selenium levels ranged from 0.156 to 0.386 mg/kg wet weight. Arsenic concentrations ranged from 0.133 to 0.530 mg/kg wet weight. PCB arochlors and congeners, pesticides, cadmium, and lead were not detected in the edible fillets of all samples analyzed from Long Pond.

#### **Miacomet Pond (MA97055), Nantucket**

Gill netting on Micaomet Pond on 25 October 1995 resulted in the collection of one black crappie and white and yellow perch. Two three-fillet composites of white perch, two three-fillet composites of yellow perch and the individual black crappie sample were analyzed for cadmium, lead, mercury, arsenic, selenium, percent lipids, PCB arochlors and congeners, and pesticides.

Mercury concentrations in fish tissue ranged from 0.332 to 1.27 mg/kg wet weight. Arsenic concentrations ranged from below detection to 0.143 mg/kg wet weight. Selenium concentrations ranged from 0.312 to 0.633 mg/kg wet weight. Cadmium, lead, PCB arochlors and congeners, and pesticides were not detected in the edible fillets of all samples analyzed from Miacomet Pond.

Due to elevated concentrations of mercury, the following site-specific fish consumption advisory was issued by MDPH.

1. "Children younger than 12 years, pregnant women and nursing mothers should not consume any fish from Miacomet Pond."
2. "The general public should not consume any white perch from Miacomet Pond."
3. "The general public should limit consumption of non-affected fish species from Miacomet Pond to two meals per month."



**Long Cove Pond (MA97049), West Tisbury, Martha's Vineyard**

Gill netting on 17 October 1995 resulted in the collection of five white perch from Long Cove Pond. A five-fillet composite of white perch was analyzed for cadmium, lead, mercury, arsenic, selenium, percent lipids, PCB arochlors and congeners, and pesticides.

Mercury in the five-fillet composite from Long Cove Pond was below the MDPH "trigger level" of 0.50 mg/kg wet weight. The arsenic concentration was 0.049 mg/kg wet weight and the selenium concentration in the composite sample was 0.484 mg/kg wet weight. Cadmium, lead, PCB arochlors and congeners, and pesticides were not detected in the edible fillets of all samples analyzed from Long Cove Pond.

**Seths Pond (MA97085), West Tisbury, Martha's Vineyard**

Gill netting on 17 October 1995 on Seths Pond resulted in the collection of chain pickerel, yellow perch and bluegill. Two individual chain pickerel samples, two three-fillet composite samples of yellow perch, and a two-fillet composite sample of bluegill were analyzed for cadmium, lead, mercury, arsenic, selenium, percent lipids, PCB arochlors and congeners, and pesticides.

Mercury levels ranged from 0.2100 to 0.8600 mg/kg wet weight. Selenium levels ranged from 0.371 to 0.569 mg/kg wet weight. Arsenic (0.072 mg/kg wet weight) was in only one individual chain pickerel sample. Cadmium, lead, PCB arochlors and congeners, and pesticides were not detected in the edible fillets of all samples analyzed from Seths Pond.

**Upper Lagoon Pond (MA97104), Oak Bluffs/Tisbury, Martha's Vineyard**

Electrofishing in Upper Lagoon Pond on 16 October 1995 resulted in the collection of brown trout, rainbow trout, and white perch. One individual brown trout sample, two individual rainbow trout samples, a two-fillet white perch composite and a three-fillet white perch composite were analyzed for cadmium, lead, mercury, arsenic, selenium, percent lipids, PCB arochlors and congeners, and pesticides.

Mercury concentrations in the fish tissue ranged from 0.1060 to 0.8930 mg/kg wet weight. Arsenic concentrations ranged from 0.056 to 0.164 mg/kg wet weight. Selenium concentrations ranged from 0.162 to 0.307 mg/kg wet weight. Cadmium, lead, PCB arochlors and congeners, and pesticides were not detected in the edible fillets of all samples analyzed from Upper Lagoon Pond.

**2000 Results**

The results of MA DEP 2000 Island Watershed fish toxics monitoring surveys described below are excerpted from *2000 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys* (Maietta and Colonna-Romano 2000).

**Head of Hummock Pond (MA97035), Nantucket:** A 17-acre pond located in Nantucket, Head of Hummock Pond is seasonally susceptible to tidal action depending upon whether the beach is breached at Hummock Pond. This unique situation allows euryhaline species such as striped bass and white perch to migrate between the ocean and the pond for short periods of time. Once the natural processes of wind and tide constrict and eventually close the breach, fish remaining in the pond become "land-locked" residents of the pond.

Mercury concentrations were below the MDPH trigger level of 0.5 mg/kg (0.24 and 0.15 mg/kg) in both samples analyzed. PCBs and organochlorine pesticides were below method detection limits in both samples analyzed from Head of Hummock Pond.

**Tom Nevers Pond (MA97097), Nantucket:** Tom Nevers Pond is a 13-acre pond located in the town of Nantucket. The watershed immediately surrounding the pond is sparsely developed and predominantly sandy dunes and scrub forest. The watershed as a whole includes a cranberry growing operation and a golf course.

Mercury was elevated (0.75 mg/kg) in a composite of yellow perch (TNP00-01-03), the only sample analyzed. Arsenic was detected in the one sample analyzed (0.045 mg/kg). PCBs and organochlorine pesticides were below method detection limits in the one sample analyzed from Tom Nevers Pond. The fact that mercury is elevated in yellow perch suggests that predatory fish from this waterbody also contain



elevated mercury concentrations and therefore the following fish consumption advisory was issued by MDPH.

1. "Children younger than 12 years, pregnant women, and nursing mothers should not eat any fish from Tom Nevers Pond."
2. "The general public should limit consumption of all fish from Tom Nevers Pond to two meals per month."

**Washing Pond (MA97100), Nantucket:** Washing Pond is a 7-acre great pond located in the town of Nantucket. Land surrounding the pond is developed residentially.

Mercury concentrations were relatively low (0.11 and 0.21 mg/kg) in both samples analyzed. Cadmium was detected (0.22 mg/kg) in a composite sample of brown bullhead. PCBs and organochlorine pesticides were below method detection limits in both samples analyzed from Washing Pond.

**Duarte Pond (MA97019), Oak Bluffs, Martha's Vineyard:** Duarte Pond is a 5-acre pond located in Oak Bluffs. The watershed is mostly forested with some residential development and a small agricultural operation.

Mercury exceeded the MDPH "trigger level" of 0.5 mg/kg in chain pickerel (0.51 mg/kg), however, the composite was composed of only two fish, which does not meet MDPH's guidelines of a minimum three-fish composite. PCBs and organochlorine pesticides were below method detection limits in all samples analyzed from Duarte Pond.

**Table B1.** 1995 MA DEP DWM Islands Watershed fish toxics monitoring data. Results are from individual and composite fish fillets with skin off.

Sample ID					Collection Date	Species Code <sup>1</sup>	Length (cm)	Weight (g)	Laboratory Sample #	Cd (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	As (mg/kg)	Se (mg/kg)	Lipids (%)	PCB Arochlors and Congeners (µg/g)	Pesticides (µg/g)
Gibbs Pond, Nantucket																	
GBF95-01		10/26/95	CP	53.5	1160	95120	<0.20	<1.00	0.8280	0.084	0.191	0.059	ND	ND			
GBF95-02		10/26/95	CP	53.5	1260	95121	<0.20	<1.00	0.1030	0.047	0.191	0.22	ND	ND			
GBF95-03		10/26/95	YP	30.5	320	95122	<0.20	<1.00	0.0900	0.109	0.186	0.035	ND	ND			
GBF95-04		10/26/95	WP	31.5	440	95123	<0.20	<1.00	0.7620	0.059	0.264	0.062	ND	ND			
GBF95-05		10/26/95	WP	19.4	80	95124	<0.20	<1.00	0.7560	<0.040	0.389	0.36	ND	ND			
GBF95-06		10/26/95	WP	18.2	80												
GBF95-07		10/26/95	WP	17.8	80												
GBF95-08		10/26/95	WP	16.6	60												
GBF95-09		10/26/95	WP	16.3	60												
Long Pond, Nantucket																	
LNF95-01		10/24/95	YP	31.6	330	95111	<0.20	<1.00	0.2400	0.335	0.156	0.073	ND	ND			
LNF95-02		10/24/95	YP	29.2	310												
LNF95-03		10/24/95	YP	28.1	220												
LNF95-04		10/24/95	YP	17.7	40	95112	<0.20	<1.00	0.0680	0.133	0.156	0.056	ND	ND			
LNF95-05		10/24/95	YP	18.4	50												
LNF95-06		10/24/95	YP	18.9	40												
LNF95-07		10/24/95	WP	35.4	540	95113	<0.20	<1.00	0.3870	0.530	0.386	0.28	ND	ND			
LNF95-08		10/24/95	WP	34.6	580												
LNF95-09		10/24/95	WP	32.2	540												
LNF95-10		10/24/95	WP	19.2	60	95114	<0.20	<1.00	0.0900	0.166	0.301	0.31	ND	ND			
LNF95-11		10/24/95	WP	19.7	80												
LNF95-12		10/24/95	WP	19.9	80												
<sup>1</sup> Species: CP = chain pickerel ( <i>Esox niger</i> ) WP = white perch ( <i>Morone American</i> ) YP = yellow perch ( <i>Perca flavescens</i> )									ND = not detected or the analytical result is at or below the established method detection limit (MDL).								



Table B1 continued.

Sample ID	Collection Date	Species Code <sup>1</sup>	Length (cm)	Weight (g)	Laboratory Sample #	Cd (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	As (mg/kg)	Se (mg/kg)	Lipids (%)	PCB Arochlors and Congeners (µg/g)	Pesticides (µg/g)
<b>Miacomet Pond, Nantucket</b>													
MCF95-01	10/25/95	WP	30.8	520	95115	<0.20	<1.00	1.2700	0.082	0.565	0.33	ND	ND
MCF95-02	10/25/95	WP	32.6	540									
MCF95-03	10/25/95	WP	30.4	460									
MCF95-04	10/25/95	WP	26.9	280	95116	<0.20	<1.00	0.7790	0.143	0.633	0.17	ND	ND
MCF95-05	10/25/95	WP	26.6	260									
MCF95-06	10/25/95	WP	26.8	280									
MCF95-07	10/25/95	YP	34.2	500	95117	<0.20	<1.00	0.6190	0.073	0.329	0.055	ND	ND
MCF95-08	10/25/95	YP	31.1	380									
MCF95-09	10/25/95	YP	32.2	400									
MCF95-10	10/25/95	YP	26.5	200	95118	<0.20	<1.0	0.3320	<0.040	0.333	0.026	ND	ND
MCF95-11	10/25/95	YP	23.7	160									
MCF95-12	10/25/95	YP	25.5	200									
MCF95-13	10/25/95	BC	26.2	300	95119	<0.20	<1.0	0.6120	<0.040	0.312	0.42	ND	ND
<b>Long Cove Pond, West Tisbury</b>													
CF95-01	10/17/95	WP	20.7	100	95105	<0.20	<1.00	0.4240	0.049	0.484	0.13	ND	ND
CF95-02	10/17/95	WP	18.5	70									
CF95-03	10/17/95	WP	18.5	80									
CF95-04	10/17/95	WP	19.4	90									
CF95-05	10/17/95	WP	19.2	100									
<sup>1</sup> Species: BC = black crappie ( <i>Pomoxis nigromaculatus</i> ) WP = white perch ( <i>Morone American</i> ) YP = yellow perch ( <i>Perca flavescens</i> )					ND - not detected or the analytical result is at or below the established method detection limit (MDL).								

Table B1 continued.

Sample ID					Collection Date	Species Code <sup>1</sup>	Length (cm)	Weight (g)	Laboratory Sample #	Cd (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	As (mg/kg)	Se (mg/kg)	Lipids (%)	PCB Arochlors and Congeners (µg/g)	Pesticides (µg/g)				
Seths Pond, West Tisbury																					
SEF95-01	10/17/95	CP	55.0	1160	95106	<0.20	<1.00	0.8600	0.072	0.371	0.010	ND	ND	ND	ND	ND	ND				
SEF95-02	10/17/95	CP	48.2	760	95107	<0.20	<1.00	0.6520	<0.040	0.444	0.060	ND	ND	ND	ND	ND	ND				
SEF95-03	10/17/95	YP	17.8	60	95108	<0.20	<1.00	0.2720	<0.040	0.547	0.060	ND	ND	ND	ND	ND	ND				
SEF95-04	10/17/95	YP	18.0	65																	
SEF95-05	10/17/95	YP	18.3	60																	
SEF95-06	10/17/95	YP	25.3	90	95109	<0.20	<1.00	0.6350	<0.040	0.569	0.10	ND	ND	ND	ND	ND	ND				
SEF95-07	10/17/95	YP	24.2	80																	
SEF95-08	10/17/95	YP	25.2	85																	
SEF95-09	10/17/95	B	18.7	140	95110	<0.20	<1.00	0.2100	<0.040	0.425	0.21	ND	ND	ND	ND	ND	ND				
SEF95-10	10/17/95	B	13.8	60																	
Upper Lagoon Pond, West Tisbury																					
ULF95-01	10/16/95	BT	35.5	540	95100	<0.20	<1.00	0.5490	0.056	0.162	0.36	ND	ND	ND	ND	ND	ND				
ULF95-02	10/16/95	RT	34.8	500	95101	<0.20	<1.00	0.1310	0.096	0.196	0.21	ND	ND	ND	ND	ND	ND				
ULF95-03	10/16/95	RT	30.5	230	95102	<0.20	<1.00	0.1060	0.164	0.162	0.58	ND	ND	ND	ND	ND	ND				
ULF95-04	10/16/95	WP	34.7	610	95103	<0.20	<1.00	0.8930	0.069	0.240	0.38	ND	ND	ND	ND	ND	ND				
ULF95-05	10/16/95	WP	31.0	500																	
ULF95-06	10/16/95	WP	23.6	210	95104	<0.20	<1.00	0.1390	0.065	0.307	0.93	ND	ND	ND	ND	ND	ND				
ULF95-07	10/16/95	WP	23.1	195																	
ULF95-08	10/16/95	WP	22.5	200																	
<sup>1</sup> Species: B = bluegill ( <i>Lepomis macrochirus</i> )									BT = brown trout ( <i>Salmo trutta</i> )									CP = chain pickerel ( <i>Esox niger</i> )			
RT = Rainbow trout ( <i>ncorhynchus mykiss</i> )									WP = white perch ( <i>Morone American</i> )									YP = yellow perch ( <i>Perca flavescens</i> )			
ND - not detected or the analytical result is at or below the established method detection limit (MDL).																					



**Table B2.** 2000 MA DEP DWM Islands Watershed fish toxics monitoring data excerpted from 2000 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys (Maietta and Colonna-Romano 2000). Results are from composite fish fillets with skin off.

Sample ID	Collection Date	Species Code <sup>1</sup>	Length (cm)	Weight (g)	Laboratory Sample #	Cd (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	As (mg/kg)	Se (mg/kg)	Lipids (%)	PCB Arochlors and Congeners (µg/g)	Pesticides (µg/g)
Head of Hummock Pond, Nantucket													
HUM00-01	9/26/00	WP	25.2	200	2000064 (L2000412-2 metals) (L2000416-2 organics)	<0.040	<0.20	0.24	<0.040	0.30	0.20	ND	ND
HUM00-02	9/26/00	WP	24.9	200									
HUM00-03	9/26/00	WP	24.0	170									
HUM00-04	9/25/00	CP	47.1	600	2000065 (L2000412-3 metals) (L2000416-3 organics)	<0.040	<0.20	0.15	0.096	0.22	0.12	ND	ND
HUM00-05	9/25/00	CP	46.4	740									
Tom Nevers Pond, Nantucket													
TNP00-01	9/25/00	YP	26.4	220	2000063 (L2000412-1 metals) (L2000416-1 organics)	<0.040	<0.20	0.75	0.045	0.26	0.20	ND	ND
TNP00-02	9/25/00	YP	26.5	200									
TNP00-03	9/25/00	YP	26.6	220									
Washing Pond, Nantucket													
WSH00-01	9/26/00	BB	32.2	460	2000066 (L2000412-4 metals) (L2000416-4 organics)	0.22	<0.20	0.11	<0.040	0.12	0.48	ND	ND
WSH00-02	9/26/00	BB	28.0	250									
WSH00-03	9/26/00	BB	29.6	290									
WSH00-04	9/26/00	YP	28.3	250	2000067 (L2000412-5 metals) (L2000416-5 organics)	<0.040	<0.20	0.21	<0.040	0.26	0.12	ND	ND
WSH00-05	9/26/00	YP	33.6	410									
WSH00-06	9/26/00	YP	29.7	290									
Duarte Pond, Oak Bluffs, Martha's Vineyard													
DUP00-01	6/19/00	BB	30.5	360	2000015 (L2000165-1)	<0.20	<0.20	0.12	<0.04	0.14	0.28	ND	ND
DUP00-02	6/19/00	BB	29.9	340									
DUP00-03	6/19/00	BB	29.8	340									
DUP00-04	6/19/00	YP	18.4	90	2000016 (L2000165-2)	<0.20	<0.20	0.13	<0.04	0.45	0.13	ND	ND
DUP00-05	6/19/00	YP	19.6	100									
DUP00-06	6/19/00	YP	20.0	110									
DUP00-07	6/19/00	YP	20.3	110	2000017 (L2000165-3)	<0.20	<0.20	0.51	<0.04	0.24	0.049	ND	ND
DUP00-08	6/19/00	YP	19.4	90									
DUP00-09	6/19/00	CP	37.7	240									
DUP00-10	6/19/00	CP	39.4	300									
<sup>1</sup> Species: BB = brown bullhead ( <i>Ameiurus nebulosus</i> ) CP = chain pickerel ( <i>Esox niger</i> ) WP = white perch ( <i>Morone Americana</i> ) YP = yellow perch ( <i>Perca flavescens</i> ) ND - not detected or the analytical result is at or below the established method detection limit (MDL) See Maietta and Colonna-Romano (2000) for MDLs													

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- MA DEP. January 1995. *Draft Laboratory Quality Assurance Plan and Standard Operating Procedures*. Massachusetts Department of Environmental Protection, Division of Environmental Analysis. Wall Experiment Station. Lawrence, MA.
- MA DEP. 2002. *Fish Contaminant Monitoring Program, Quality Assurance Project Plan, 2000*. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.
- Maietta, R. J. and J. Colonna-Romano. 2000. *2000 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys*. Massachusetts Department of Environmental Protection, Division of Watershed Management. Worcester, MA.
- MDPH. 2002. *Freshwater Fish Consumption Advisory List – June 2002*. Massachusetts Department of Public Health. Bureau of Environmental Health Assessment. Boston, MA.



# APPENDIX C – WMA TABLE

Table C1. List of WMA registered and permitted average annual water withdrawals in the Islands Watershed (Levangie 2002).

Permit	Registration	Name	20 Year Permitted Volume (MGD)	Registered Volume (MGD)	Source G = Ground S = Surface	Withdrawal location	Segment Number
9P242319702		Nantucket Golf Club, Inc.	0.19	N/A	NGC Well #1 (G)	Nantucket	MA97097
9P242308902		The Vineyard Golf Club	0.15	N/A	Irrigation Well (G)	Edgartown	MA97-17
9P44231970		Miacomet Golf Course	0.12	N/A	GW-1 (G)	Nantucket	MA97055
9P42308901	42308901	Edgartown Water Department (PWS ID 4089000)	0.27	0.65	Machacket 4089000-04G (G) Lily Pond 4089000-05G (G) Wintucket Well #1 4089000-06G (G) Quenamica 4089000-07G (G)	Edgartown	N/A MA97-10 MA97-17 MA97-17
	42319701	Northland Cranberries, Inc. transferred to Nantucket Conservation Foundation	N/A	2.42	Winswept Bog well (G) Winswept Bog Pond (S) Milestone Road Bog well (G) Gibbs Pond-Milestone Bog (S)	Nantucket	MA97-01 MA97-01 MA97097 MA97097
	42319702	Siasconset Water Department (PWS ID 4197001)	N/A	0.11	4197001-01G (G) 4197001-02G (G)	Siasconset	N/A N/A
9P42319701	42319703	Wannacomet Water Company (PWS ID 4197000)	0.62	0.61	Wyers Valley 197-01G Wyers Valley 197-02G State Forest Well 197-03G	Nantucket	MA97-01 MA97-01 N/A
	42319704	Bartlett's Ocean View Farm	N/A	0.42	01G Bartlett Farm (G) 02G Bartlett Farm (G) 01S Bartlett Farm (S) 02S Bartlett Farm (S)	Nantucket	N/A N/A N/A N/A
	42319705	Sankaty Head Golf Club	N/A	0.13	2 registered groundwater points		N/A
9P42322101	42322101	Oak Bluffs Water Department (PWSID 4221000)	0.35	0.58	Well #1 Lagoon Pond 4221000-01G (G) Farm Neck Pump Station #2 4221000-02G State Forest Well #3 4221000-03G (G) Well #4 4221000-04G (G)	Oak Bluffs	MA97-11 Farm Pond MA97-11 MA97-11
	42322102	Farm Neck Golf Club	N/A	0.16	2 registered groundwater points		MA97-10
9P42329601	42329602	Tisbury Water Works (PWS ID 4296000)	0.22	0.55	Well #1 Sandborn Street Station 4296000-01G (G) Tashmoo Well - West Spring Street 4296000-02G (G) Manter Well #3 4296000-03G (G)	Vineyard Haven	N/A MA97-12 MA97-12
	42329603	Mink Meadows Golf Club	N/A	0.1	1 registered groundwater point	Tisbury	N/A
	V42329601	Thimble Farm	N/A	0.01	Thimble Farm 01G (G) Thimble Farm 02G (G)	Tisbury	MA97-11

N/A = Not Applicable



## APPENDIX D - MA DEP GRANT AND LOAN PROGRAMS

Excerpted from the MA DEP World Wide Web sites, <http://www.state.ma.us/dep/brp/mf/files/glprgm.pdf> and <http://www.state.ma.us/dep/brp/mf/othergrt.htm>, unless otherwise referenced.

### 604(b) WATER QUALITY PLANNING GRANT PROGRAM

This Grant Program is authorized under Section 604(b) of the Federal Clean Water Act. The program is designed to assist eligible recipients in providing water quality assessment and planning assistance to local communities. Priority is given to projects that provide diagnostic information to support the DEP's watershed management activities and to projects located in one of the priority watersheds targeted for assessment work by the DEP. Indicative project summaries for recent 604(b) projects in the Islands Watershed include:

- 96-04/604 *Edgartown Great Pond: Nutrient Loading and Recommended Management Program 1996-1998*. This project will provide delineation of critical areas of the ground watershed of Edgartown Great Pond on Martha's Vineyard. Land-use analysis and nitrogen loading modeling will be performed to examine build-out scenarios and the resultant potential impacts to the pond. Public outreach will be ongoing throughout the project to inform and involve watershed stakeholders and residents in the development of long and short term pond watershed management strategies. Specific tasks of the project include: 1) delineate the groundwater watershed of the pond and perform an assessment of pond recharge rates and groundwater flows; 2) map existing and projected land use of the groundwater recharge area and model nitrogen loading for three growth scenarios; 3) determine a nitrogen loading limit for the pond; 4) provide a matrix of watershed management strategies for the pond and present two comprehensive management scenarios for water quality improvement/preservation for public consideration; and 5) provide public education via the press and public meetings to promote awareness of the project.
- 98-04/604 *Assessment of Current Quality and Projected Nutrient Loading: Menemsha Pond and Chilmark Great Pond*. This project will assess the water quality and determine the nutrient loading limits for Menemsha Pond and Chilmark Great Pond. To accomplish this, the Martha's Vineyard Commission will: 1) determine sources of bacterial contamination and assess nutrient status in Chilmark Great Pond using both existing and new water quality data; 2) determine nitrogen loading to Chilmark Great Pond and Menemsha Pond; 3) determine flushing time and estimate nitrogen loading limit for Chilmark Great Pond and Menemsha Pond; 4) project buildout loading and assess impact on the ponds; and 5) recommend options to reduce nitrogen loads (as needed) by bylaw revisions, easement acquisitions, and pond opening cycles.
- 99-02/604 *Nutrient Loading to Two Great Ponds: Tisbury Great Pond and Lagoon Pond*. Martha's Vineyard Commission will assess water quality in both Tisbury Great Pond and Lagoon Pond using existing water quality data and by acquiring new data. Groundwater watershed contribution boundaries, flushing times, existing and potential land uses, buildout nutrient loads and acceptable load limits will be determined for each pond. Options to meet loading limits including land purchase, easements, zoning changes, performance standards and sewage treatment options will be prepared for both ponds.
- 03-01/604 *Coastal Pond Water Quality Assessment*. The goal of this project is to collect additional water quality data for nine coastal ponds on Martha's Vineyard. The ponds to be sampled include: Sengekontacket, Cape Pogue, Poucha, Tashmoo, Oak Bluffs Harbor, Farm, Menemsha, Chilmark, and Squibnocket Ponds. Data collected will be used to prepare these ponds for entry in the Commonwealth's Estuaries Project. Specific activities to be conducted by the Contractor during this project include: 1) follow existing Massachusetts Estuaries Program (MEP) Quality Assurance Project Plan (QAPP) to insure standard survey and water quality data collection methods; 2) prepare Sampling and Analysis Plans (SAPs) including field survey station locations, GPS coordinates, and GIS maps of sample locations; 3) collect water quality samples during four sampling rounds; and 4) prepare final data summary with results posted on Vineyard Conservation Society's web site.



### **104(B)(3) WETLANDS AND WATER QUALITY GRANT PROGRAM**

This Grant Program is authorized under Wetlands and Clean Water Act Section 104(b)(3) of the federal Clean Water Act. The water quality proposals received by MA DEP under this National Environmental Performance Partnership Agreement (NEPPA) with the U.S. Environmental Protection Agency is a results-oriented approach that will focus attention on environmental protection goals and the efforts to achieve them. The goals of the NEPPA are to: 1) achieve clean air, 2) achieve clean water, 3) protect wetlands, 4) reduce waste generation, and 5) clean up waste sites. Currently there are no 104(b)(3) projects specific to the Islands Watershed.

### **319 NONPOINT SOURCE GRANT PROGRAM**

This grant program is authorized under Section 319 of the CWA for implementation projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution. In order to be considered eligible for funding projects must: implement measures that address the prevention, control, and abatement of NPS pollution; target the major source(s) of nonpoint source pollution within a watershed/subwatershed; have a 40 percent non-federal match of the total project cost (match funds must meet the same eligibility criteria as the federal funds); contain an appropriate method for evaluating the project results; address activities that are identified in the Massachusetts NPS Management Program Plan. Recent 319 projects specific to the Islands Watershed include:

- 98-12/319 *Demonstrating the Use of Eelgrass Monitoring to Assess Coastal Nonpoint Source Pollution*. This project will establish and demonstrate the use of eelgrass as an environmental indicator to assess water quality conditions in the North Coastal, South Coastal, Boston Harbor, Cape Cod and the Islands, and Buzzards Bay Coastal drainage area. By quantifying the relative health of the plants (presence/absence, depth, leaf density and length) the eelgrass habitat requirements of particular coastal embayments can be established. This will help provide a mechanism to relate anthropogenic inputs to the relative health of estuarine areas. The information obtained can be used to assist Watershed Teams better identify coastal waters that are impaired or in need of further assessment activities and/or potential management actions. Specific tasks will include: 1) establish 40 transects or monitoring stations along coastal Massachusetts; 2) conduct surveys incorporating underwater videography, GPS surveying and high accuracy digital mapping to create an eelgrass monitoring data layer of the relative health of selected coastal areas where nutrient and other landuse inputs have adversely effected eelgrass resources; 3) determine the relationship between water quality and eelgrass beds; 4) produce a base map (ARC View) incorporating the fieldnotes - recorded data and representative scanned frames of the underwater video recording; and 5) conduct information transfer by archiving base map and making it available to user groups through the MA DEP/EOEA MassGIS data distribution system.
- 01-18/319 *Lagoon Pond Runoff Renovation Project*. Lagoon Pond receives direct discharge of untreated stormwater at three locations. Fecal coliform bacteria is a known pollutant carried by this runoff. Nitrogen, phosphorous, and BOD typical of residential stormwater are also suspected to be present. This project will infiltrate and, thereby, treat the first flush of stormwater from the three sources to remove bacteria, BOD, and phosphorus. This will be accomplished by installing catch basins and infiltration systems designed to capture the first flush of stormwater.

### **RESEARCH AND DEMONSTRATION GRANT PROGRAM**

The Research and Demonstration Program (R&D) is authorized by Section 38 of Chapter 21 of the Massachusetts General Laws and is funded by proceeds from the sale of Massachusetts bonds. Specifically, the R&D Program was established to enable the MA DEP to conduct a program of study and research and demonstration relating to water pollution control and other scientific and engineering studies "...so as to insure cleaner waters in the coastal waters, rivers, streams, lakes and ponds of the Commonwealth." Currently there are no R&D projects specific to the Islands Watershed.



## **SOURCE WATER PROTECTION TECHNICAL ASSISTANCE/LAND MANAGEMENT GRANT PROGRAM**

The Source Water Protection Technical Assistance/Land Management Grant Program provides funds to public water suppliers and third party technical assistance organizations that assist public water suppliers in protecting local and regional ground and surface drinking water supplies. Currently there are no Source Water Protection Grant projects specific to the Islands Watershed.

## **WELLHEAD PROTECTION GRANT PROGRAM**

The Wellhead Protection Grant Program provides funds to assist public water suppliers in addressing wellhead protection through local projects and education. Currently there are no Wellhead Protection Grant projects specific to the Islands Watershed.

## **MASSACHUSETTS WATERSHED INITIATIVE (MWI) PROJECT**

Each year EOEA Watershed Team Leaders, in conjunction with State and Federal agencies, municipal governments and regional planning agencies, universities, local watershed associations, businesses and other groups, develop work plans that identify the most important goals for each watershed and the specific projects and programs which are needed to meet those goals. Recent MWI projects specific to the Islands Watershed include:

- 00-10/MWI *Miacomet Pond Nutrient Loading Model*. This project will develop a computer model to support management of Miacomet Pond. The model will support hydrology, water quality, and TMDL studies, development of flood and water quality management strategies and development of hydrologic and water quality monitoring programs. Specific tasks include: 1) review of documents, data and other relevant information about Miacomet Pond; 2) prepare a Quality Assurance Project Plan and conduct sampling; 3) conduct modeling and model calibration; 4) conduct project outreach; and 5) prepare a final report.
- 01-05/MWI *Lake Tashmoo and Lake Anthony/Sunset Lake Nutrient Loading Studies*. This project will perform nutrient loading studies for Lake Tashmoo and Lake Anthony/Sunset Lake complex. Specific tasks include: 1) review available data and identify gaps; 2) prepare a quality assurance project plan for the field sampling and data collection program; 3) delineate watershed contributing areas for the lakes; 4) map existing contributing area land uses; 5) install tide gages to collect information on flushing rates; 6) conduct public education and outreach; and 7) prepare final project reports identifying watershed management strategies.
- 01-11/MWI *Madaket Harbor Circulation Study*. This project will develop and apply a hydrodynamic model for the Madaket Harbor System on Nantucket Island. Specific tasks include: 1) conduct data acquisition and review of existing information; 2) develop a Quality Assurance Project Plan (QAPP) for the hydrologic and water quality data collection program; 3) perform sampling and data collection in accordance with approved QAPP; 4) apply and calibrate the hydrodynamic and flushing models to the Madaket Harbor/Long Pond System; and 5) prepare a final project report.
- 02-10/MWI *Martha's Vineyard Source Water Protection Project*. This project will identify and assess potential water quality impacts within Zone II's associated with well fields in the towns of Edgartown, Oak Bluffs, and Tisbury. Tasks include: 1) conduct land use evaluation and develop nitrate-loading evaluations for existing and protected land uses within the Zone II's for the town wells; 2) provide assistance to prioritize lands for protection and control and address management of existing protected lands, particularly the green lands and the Manual F. Correllus State Forest; 3) develop a contingency plan between Edgartown and Oak Bluffs for public water systems; 4) meet with Islands Watershed Team to present progress updates; and 5) prepare a final project report.



- 03-18/MWI *Martha's Vineyard Great Ponds Water Quality Monitoring*. In conjunction with the Massachusetts Estuaries Initiative, this project will perform water quality sampling at Edgartown Great Pond, Tisbury Great Pond, Lagoon Pond, Squibnocket Pond, Chilmark Pond, Mememsha Pond, Lake Tashmoo, and the Sunset Lake/Lake Anthony Complex (Oak Bluffs Harbor) on Martha's Vineyard Island. Tasks include: 1) develop monitoring plans for each watershed; 2) conduct sampling for nutrients and other parameters; 3) prepare a final project report, and 4) meet with the Islands Watershed Team.
- 03-19/MWI *Madaket Harbor Water Quality Monitoring*. In conjunction with the Massachusetts Estuaries Initiative, this project will conduct baseline water quality sampling in Madaket Harbor to assess water quality conditions. Tasks include: 1) develop a monitoring plan; 2) conduct sampling for nutrients and other parameters; 3) review and compile existing and historical data; 4) prepare a final project report; and 5) meet with the Islands Watershed Team.
- EOEA funded Volunteer Monitoring Grant Program, *Martha's Vineyard Coordinated Education Program 2001 - 2002* (Martha's Vineyard Commission). The purpose of this project is to improve environmental education to protect the Sole Source Aquifer (SSA). This education targets visitors, residents, students and local officials as recipients. Tasks to be conducted include: 1) coordinate the existing organizations that have educational activities oriented toward the Sole Source Aquifer and the coastal ponds; and 2) to begin a public education program to raise the awareness of the general public on water resource protection issues and opportunities.
- EOEA funded Massachusetts Volunteer Monitoring Grant, *Water Quality Monitoring Project for Harbors and Estuaries 2000 - 2001* (Martha's Vineyard Regional High School). This project will develop an Island Quality Monitoring Program of all the harbors and estuaries of Martha's Vineyard and coordinate the sharing and using of water quality data collection equipment throughout Martha's Vineyard. Tasks include: 1) purchase monitoring equipment to coordinate baseline studies of the Barnstable County Extension Service; 2) prepare a Quality Assurance Project Plan (QAPP) to verify the correct operation of the equipment; 3) conduct water quality sampling; and 4) prepare a final report.
- EOEA funded Massachusetts Stewardship Grant Program, *Planning for Sustainable Growth on Martha's Vineyard 2000 - 2002* (Martha's Vineyard Commission). This project will identify, develop and seek consensus on a set of sustainability indicators that will clarify the interconnections among water quality, the environment, the economy, sustainable development, and the social fabric of the community. Tasks include: 1) organize and train Community Advisory Group (CAG), work with staff from the Wampanoag Tribe to coordinate efforts on environmental indicators; 2) continue working with CAG and other groups to review and precede with efforts of environmental indicators; 3) select and meet with Massachusetts Institute of Technology (MIT) and high school interns to confirm work plans and expected outcomes; and 4) prepare and finalize reports of MIT and high school internships for extensive review.

#### **CLEAN WATER STATE REVOLVING LOAN FUND (SRF) PROGRAM**

The Massachusetts State Revolving Loan Fund for water pollution abatement projects was established to provide a low-cost funding mechanism to assist municipalities seeking to comply with federal and state water quality requirements. The SRF Program is jointly administered by the Division of Municipal Services of the MA DEP and the Massachusetts Water Pollution Abatement Trust. Each year the MA DEP solicits projects from the Massachusetts municipalities and wastewater districts to be considered for subsidized loans, which are currently offered at 50% grant equivalency (approximates a two percent interest loan). The SRF Program now provides increased emphasis on watershed management priorities. A major goal of the SRF Program is to provide incentives to communities to undertake projects with meaningful water quality and public health benefits and which address the needs of the communities and the watershed. Recent SRF projects specific to the Islands Watershed include:

- 98-143/SRF *Washington Street Interceptor Sewer Construction Project*. This project will provide a replacement sewer for the existing eighteen inch diameter pipeline which is leaking into Nantucket Harbor and a nearby saltmarsh. Implementation of the project will improve water quality in the harbor and allow the wastewater treatment plant to operate more efficiently.



- 98-144/SRF *Comprehensive Wastewater Management Plan (CWMP) EIR Siasconset*. This project will produce a CWMP which addresses wastewater requirements of the area; develop alternatives such as treatment in Siasconet with a centralized plant or connecting problem areas to the central facility at surfside; and evaluate the option of treatment facilities located remote from the discharge areas.
- 98-145/SRF *Comprehensive Wastewater Management Plan (CWMP) Surfside*. This project will produce a CWMP for the Surfside wastewater management area. The project is necessary because there are failing on-site systems near the Surfside service area; the treatment plant processes need to be reviewed for compliance with the groundwater discharge permit; there have been areas of the plant site which have been subject to coastal erosion; there have been odor complaints from the abutters to this wastewater facility.
- 00-14/SRF *Wastewater Treatment Collection and Disposal*. This project will result in the construction of a new SBR wastewater plant to treat 375,000 GPD of wastewater, a new collector system, and a new disposal facility at Ocean Park. The new facilities will minimize public health risks due to contamination from wastewater.
- 00-33/SRF *Comprehensive Wastewater Management Plan/Environmental Impact Report for Nantucket*. This project will "identify areas within the Island with sub-surface wastewater disposal problems and develop a plan to mitigate or eliminate the problems (Earth Tech 2001). The Town has established a three-phased approach for the Massachusetts Environmental Policy Act review of this project: Phase I – Environmental Notification Form/Needs Analysis and Screening of Alternatives; Phase II – Draft Comprehensive Wastewater Plan and Environment Impact Report; and Phase III – Final Comprehensive Wastewater Management Plan and Environmental Impact Report."
- 00-34/SRF *Stormwater Management Plan*.

#### **COMMUNITY SEPTIC MANAGEMENT PROGRAM**

The enactment of the Open Space Bond Bill in March of 1996 provided new opportunities and stimulated new initiatives to assist homeowners with failing septic systems. The law appropriated \$30 million to the MA DEP to assist homeowners. The Department will use the appropriation to fund loans through the Massachusetts Water Pollution Abatement Trust. The fund will provide a permanent state/local administered revolving fund to assist income-eligible homeowners in financing necessary Title 5 repairs. Working together, the MA DEP and the Trust have created the Community Septic Management Program to help Massachusetts' communities protect threatened ground and surface waters while making it easier to comply with Title 5. This loan program offers three options from which a local governmental unit can choose.

#### **MASSACHUSETTS DRINKING WATER STATE REVOLVING FUND PROGRAM**

The Massachusetts Drinking Water State Revolving Fund (DWSRF) provides low-cost financing to help community public water suppliers comply with federal and state drinking water requirements. The DWSRF Program's goals are to protect public health and strengthen compliance with drinking water requirements, while addressing the Commonwealth's drinking water needs. The Program incorporates affordability and watershed management priorities. The DWSRF Program is jointly administered by the Division of Municipal Services of the Department of Environmental Protection and the Massachusetts Water Pollution Abatement Trust (Trust). The current subsidy level is equivalent to a 50% grant, which approximates a two percent interest loan. The Program will initially operate with approximately \$50 million in financing capacity. For calendar years 1999 through 2003, up to \$400 million may be available through the loan program.

#### **REFERENCES**

Earth Tech. October 2001. *Environmental Notification Form, Nantucket Island, Comprehensive Wastewater Management Plan*. Earth Tech. Concord, MA.



## APPENDIX E - DMF SHELLFISH DATA, ISLANDS WATERSHED

It is the mission of the Massachusetts Division of Marine Fisheries (DMF) to manage, develop, and protect the Commonwealth's renewable living marine resources to provide the greatest public benefit. DMF fosters protection of the marine environment by cooperating with other state and federal agencies on pollution abatement, coastal wetlands protection and other programs concerning coastal waters and marine life. DMF monitors coastal contaminant levels in fish and shellfish, operates a shellfish depuration facility, and evaluates the impacts of coastal development on marine fish and their habitats. DMF provides assistance to local shellfish officers on matters affecting the management of shellfish, and provides expertise on anadromous fish and construction assistance on fishways. Other DMF programs assist commercial and recreational fishermen and educate the public on marine resource issues and values.

The DMF Shellfish Management Program manages shellfish growing areas in compliance with the National Shellfish Sanitation Program (NSSP). The NSSP is a federal/state cooperative program recognized by the U.S. Food and Drug Administration (USFDA) and the Interstate Shellfish Sanitation Conference (ISSC). One goal of this program is the sanitary control of shellfish harvested and sold for human consumption. Growing areas are managed with respect to shellfish harvest for direct human consumption and comprise at least one or more classification areas. The classification areas are the management units, and range from being approved to prohibited (six different classification types in all) with respect to shellfish harvest (Tables E1 and E2).

Table E1. DMF Shellfish Management Program Managed Shellfish Growing Area Classifications.

Classification Type	Definition
Approved	Open for harvest of shellfish for direct human consumption.
Conditionally Approved	During the time the area is approved, it is open for harvest of shellfish for direct human consumption subject to local rules and state regulations.
Conditionally Restricted	During the time the area is restricted, it is only open for the harvest of shellfish with depuration subject to local rules and state regulations.
Restricted	Open for harvest of shellfish with depuration subject to local rules and state regulations for the relay of shellfish.
Management Closure	Closed for the harvest of shellfish. Not enough testing has been done in the area to determine whether it is fit for shellfish harvest or not.
Prohibited	Closed for the harvest of shellfish.

Classification area codes and town names identify each DMF shellfish area. The Islands Watershed 2000 Water Quality Assessment Report describes each shellfishing area by its classification area code and the assessed region is defined in square miles within the MA DEP/DWM water body system segment. As of July 2000 DMF classified a total of 406318.357 acres in the Islands Watershed (Table E2).

Table E2. Summary Shellfish Classification Area Information as of July 2000.

<b>Classification Type</b>	<b>Area (Acres)</b>
Approved	401458.660
Conditionally Approved	3439.702
Restricted	0
Conditionally Restricted	0
Prohibited	1311.928
Management Closure	108.067
<b>Total</b>	<b>406318.357</b>

Table E3. DMF - Shellfish Project Classification Area Information as of July 2000.

<b>Town</b>	<b>Classification Area Code</b>	<b>Classification Type</b>	<b>Area (acres)</b>
Chilmark	E11.2	Approved	0.001
Chilmark	V1.0	Approved	0.066
Chilmark	V2.0	Approved	340.529
Chilmark	V2.1	Prohibited	7.959
Chilmark	V3.0	Approved	112.857
Chilmark	V30.0	Approved	3341.078
Chilmark	V30.0	Approved	17046.612
Chilmark	V31.0	Approved	97.806
Chilmark	V31.3	Prohibited	17.117
Chilmark	V31.4	Prohibited	59.769
Chilmark	V31.5	Conditionally Approved	79.572
Chilmark	V32.0	Prohibited	161.561
Chilmark	V32.0	Prohibited	36.476
Chilmark	V33.0	Approved	3222.020
Chilmark	V33.0	Approved	474.597
Chilmark	V34.0	Approved	3722.797
Chilmark	V34.0	Approved	17195.732
Chilmark	V35.0	Approved	281.838
Chilmark	V35.1	Prohibited	72.538
Chilmark	V35.2	Prohibited	0.774
Chilmark	V4.0	Approved	7468.079
Chilmark	V4.1	Prohibited	10.986
Chilmark	V4.2	Prohibited	6.177
Chilmark	V4.3	Prohibited	5.640
Chilmark	V5.0	Approved	2.569
Edgartown	NS3.0	Approved	1009.039
Edgartown	NS3.0	Approved	1246.633
Edgartown	NS4.0	Approved	687.267
Edgartown	NT14.0	Approved	3057.412
Edgartown	NT14.0	Approved	641.398
Edgartown	V12.0	Approved	153.725
Edgartown	V12.0	Approved	4233.305
Edgartown	V13.0	Approved	2016.885
Edgartown	V13.0	Approved	3347.054
Edgartown	V16.0	Approved	381.102
Edgartown	V16.20	Approved	10.697
Edgartown	V16.23	Approved	0.001
Edgartown	V16.25	Approved	4.162
Edgartown	V17.0	Approved	83.615
Edgartown	V18.0	Approved	832.351



<b>Town</b>	<b>Classification Area Code</b>	<b>Classification Type</b>	<b>Area (acres)</b>
Edgartown	V18.0	Approved	34.969
Edgartown	V19.0	Approved	41.747
Edgartown	V19.1	Conditionally Approved	186.404
Edgartown	V20.0	Approved	1253.869
Edgartown	V21.0	Approved	1522.112
Edgartown	V22.0	Approved	209.912
Edgartown	V23.0	Approved	14742.190
Edgartown	V23.0	Approved	7377.580
Edgartown	V23.0	Approved	4997.364
Edgartown	V24.0	Approved	4295.425
Edgartown	V24.0	Approved	14015.242
Edgartown	V25.0	Management Closure	38.219
Edgartown	V26.0	Conditionally Approved	876.055
Edgartown	V27.0	Management Closure	58.660
Edgartown	V28.0	Management Closure	11.188
Edgartown	V29.0	Prohibited	187.926
Gay Head	V1.0	Approved	9880.603
Gay Head	V1.0	Approved	4057.009
Gay Head	V2.0	Approved	335.581
Gay Head	V33.0	Approved	1306.497
Gay Head	V33.0	Approved	6889.900
Gay Head	V35.0	Approved	246.407
Gay Head	V35.3	Prohibited	4.558
Gay Head	V35.4	Prohibited	0.640
Gosnold	BB1.0	Approved	0.005
Gosnold	BB14.0	Approved	0.003
Gosnold	BB16.0	Approved	0.008
Gosnold	E1.0	Approved	3921.922
Gosnold	E1.0	Approved	5.703
Gosnold	E1.0	Approved	13726.042
Gosnold	E10.0	Conditionally Approved	37.140
Gosnold	E11.1	Prohibited	69.918
Gosnold	E11.2	Approved	13640.790
Gosnold	E11.2	Approved	7565.610
Gosnold	E12.0	Approved	10915.434
Gosnold	E13.0	Approved	223.470
Gosnold	E14.0	Approved	253.285
Gosnold	E2.1	Conditionally Approved	135.128
Gosnold	E2.2	Approved	36.389
Gosnold	E3.0	Approved	45.763
Gosnold	E4.0	Approved	5310.230
Gosnold	E4.0	Approved	19047.927
Gosnold	E5.0	Approved	257.957
Gosnold	E6.0	Approved	594.584
Gosnold	E7.0	Prohibited	79.135
Gosnold	E8.0	Approved	409.700
Gosnold	E9.1	Prohibited	8.559
Gosnold	E9.2	Conditionally Approved	97.260
Gosnold	SC1.0	Approved	246.991
Gosnold	SC1.0	Approved	2.332
Gosnold	SC2.0	Approved	7.415

Town	Classification Area Code	Classification Type	Area (acres)
Gosnold	SC2.0	Approved	19.704
Gosnold	SC3.0	Approved	1175.978
Gosnold	SC3.0	Approved	7.782
Gosnold	SC3.0	Approved	0.607
Gosnold	SC3.0	Approved	14.026
Nantucket	NS2.0	Approved	2000.138
Nantucket	NT1.0	Approved	3569.839
Nantucket	NT1.0	Approved	17148.327
Nantucket	NT10.0	Approved	3384.191
Nantucket	NT10.0	Approved	14363.300
Nantucket	NT11.1	Prohibited	43.107
Nantucket	NT11.2	Prohibited	0.718
Nantucket	NT11.3	Conditionally Approved	918.946
Nantucket	NT12.0	Approved	2137.432
Nantucket	NT12.0	Approved	10359.433
Nantucket	NT13.0	Approved	5402.314
Nantucket	NT13.0	Approved	14574.186
Nantucket	NT14.0	Approved	10913.391
Nantucket	NT14.0	Approved	9970.554
Nantucket	NT2.1	Approved	1265.831
Nantucket	NT2.1	Approved	77.153
Nantucket	NT2.2	Prohibited	97.843
Nantucket	NT3.0	Approved	1630.926
Nantucket	NT4.0	Approved	167.419
Nantucket	NT4.1	Prohibited	26.216
Nantucket	NT5.0	Approved	1805.967
Nantucket	NT6.0	Approved	52.605
Nantucket	NT7.0	Approved	3098.298
Nantucket	NT7.0	Approved	17616.478
Nantucket	NT8.0	Approved	4405.900
Nantucket	NT8.0	Approved	26180.888
Nantucket	NT9.0	Prohibited	270.755
Nantucket	V23.0	Approved	2.886
Nantucket	V23.0	Approved	258.989
Oak Bluffs	NS4.0	Approved	285.939
Oak Bluffs	SC17.0	Approved	0.008
Oak Bluffs	V10.0	Conditionally Approved	422.634
Oak Bluffs	V10.0	Conditionally Approved	10.276
Oak Bluffs	V11.0	Approved	226.652
Oak Bluffs	V11.2	Prohibited	3.078
Oak Bluffs	V11.2	Prohibited	0.344
Oak Bluffs	V11.22	Approved	18.173
Oak Bluffs	V12.0	Approved	383.021
Oak Bluffs	V12.0	Approved	7968.448
Oak Bluffs	V13.0	Approved	1361.766
Oak Bluffs	V13.0	Approved	1969.682
Oak Bluffs	V14.20	Conditionally Approved	9.694
Oak Bluffs	V14.21	Conditionally Approved	4.636
Oak Bluffs	V14.24	Conditionally Approved	6.976
Oak Bluffs	V14.24	Conditionally Approved	4.403
Oak Bluffs	V14.4	Conditionally Approved	8.646



<b>Town</b>	<b>Classification Area Code</b>	<b>Classification Type</b>	<b>Area (acres)</b>
Oak Bluffs	V15.0	Prohibited	33.949
Oak Bluffs	V15.0	Prohibited	10.091
Oak Bluffs	V16.0	Approved	158.671
Oak Bluffs	V16.22	Approved	21.791
Oak Bluffs	V16.23	Approved	21.372
Oak Bluffs	V16.26	Approved	21.459
Oak Bluffs	V16.27	Approved	24.604
Oak Bluffs	V16.28	Approved	18.236
Oak Bluffs	V16.29	Approved	24.631
Oak Bluffs	V16.4	Approved	17.017
Oak Bluffs	V9.0	Approved	191.074
Oak Bluffs	V9.0	Approved	585.727
Tisbury	V10.0	Conditionally Approved	544.238
Tisbury	V10.0	Conditionally Approved	0.714
Tisbury	V10.20	Conditionally Approved	11.439
Tisbury	V11.0	Approved	238.225
Tisbury	V11.1	Approved	8.988
Tisbury	V11.3	Prohibited	1.525
Tisbury	V11.6	Conditionally Approved	32.264
Tisbury	V12.0	Approved	1.395
Tisbury	V5.0	Approved	0.142
Tisbury	V7.0	Approved	2796.508
Tisbury	V7.0	Approved	1323.232
Tisbury	V8.0	Approved	251.623
Tisbury	V8.1	Prohibited	8.185
Tisbury	V8.20	Approved	6.885
Tisbury	V9.0	Approved	318.041
Tisbury	V9.0	Approved	1674.432
West Tisbury	V24.0	Approved	0.308
West Tisbury	V24.0	Approved	0.197
West Tisbury	V30.0	Approved	1035.415
West Tisbury	V30.0	Approved	4041.574
West Tisbury	V31.0	Approved	413.218
West Tisbury	V31.3	Prohibited	43.884
West Tisbury	V31.5	Conditionally Approved	53.277
West Tisbury	V5.0	Approved	6016.470
West Tisbury	V6.0	Prohibited	42.500





